

# **DEPARTMENT OF BIOCHEMISTRY**

## **PROGRAMME- B.Sc. BIOCHEMISTRY**

### **Program Outcome**

To gain knowledge about the principles that govern complex biological systems and to give students a basic awareness in biochemical processes, to develop analytical, technical and critical thinking skills and to make them scientifically capable to update scientific knowledge and apply them in day to day life.

### **Programme specifications**

<b>Programme Title</b>	B.Sc. BIOCHEMISTRY
<b>Pattern of Delivery</b>	Full Time
<b>Programme Length</b>	3 Years

### **Aims of the programme**

- To give students basic concepts of Biochemistry and its nature o interdisciplinary importance.
- To gain knowledge about the principles that governs complex biological systems.
- To undertake investigations and perform analyses that provide information about biochemical questions and help to solve biochemical problems
- To understand the experimental dimension of the molecular approach to biology
- To have an awareness of the ethical aspects of molecular science.

## Course Outcome

Delivery Pattern	Paper	Paper Code	Objectives
<b>First Semester</b>	Introduction To Biochemistry & Cell Biology	BCH1B01	<ul style="list-style-type: none"> <li>▪ To provide a general introduction to Biochemistry as a discipline and to highlight its foundations</li> <li>▪ To equip the students with the basic knowledge of good laboratory practices.</li> <li>▪ To introduce the types of molecular interactions, concepts on acids, bases and solutions, and the physical aspects of Biochemistry</li> <li>▪ To understand cell as the basic structural and functional unit of life, structure, and functions of each organelle, transport of molecules across the cell, cellular communications, cell cycle, and cell death.</li> </ul>
<b>Second Semester</b>	Biomolecules I	BCH2B02	<ul style="list-style-type: none"> <li>▪ To familiarize the students with the molecules that make up the living system, viz. carbohydrates, amino acids, lipids, vitamins and minerals: their classification, general reactions, structure, cellular functions and daily requirement..</li> <li>▪ To make the students recognize the</li> </ul>

			sources of each biomolecule among the food materials in their daily life
<b>Third Semester</b>	Biomolecules II	BCH3B03	<ul style="list-style-type: none"> <li>▪ To introduce the structural features and types of bonds in proteins and nucleic acids, their classification and structural organization.</li> <li>▪ To understand how their structure correlates with their cellular function.</li> <li>▪ To give an idea about different methods of protein and DNA sequencing</li> <li>▪ To familiarize with the bioinformatics tools and data analysis. Understand the importance and applications of bioinformatics</li> </ul>
	Techniques In Biochemistry	BCH3B04	<ul style="list-style-type: none"> <li>▪ To introduce the various techniques used in biochemical separation and analysis.</li> <li>▪ To give exposure to the instruments used and the principle behind each technique.</li> <li>▪ To understand the biochemical importance and applications of the techniques.</li> </ul>
	Practical I	BCH3B05	<ul style="list-style-type: none"> <li>▪ To train the students to make different types of solutions and buffers and correlate theoretical knowledge on the preparation of solutions.</li> <li>▪ To equip the students to perform analysis using the instruments in a biochemical laboratory.</li> <li>▪ To make them analyze biochemical samples qualitatively.</li> </ul>

<b>Fourth Semester</b>	Enzymology	BCH4B06	<ul style="list-style-type: none"> <li>▪ To introduce enzymes and provide knowledge about their specificity and activity.</li> <li>▪ To understand their classification, nomenclature, catalytic mechanism, kinetics and regulation.</li> <li>▪ To give idea on the extraction and purification of enzymes from their natural sources, enzymological techniques and applications.</li> <li>▪ To give an idea about immobilization</li> <li>▪ To understand about different types of enzyme inhibition</li> </ul>
	Intermediary Metabolism I	BCH4B07	<ul style="list-style-type: none"> <li>▪ To provide the students a detailed understanding of the importance of metabolic pathways in living cells and methods adopted to trace them out.</li> <li>▪ To make the students understand the anaerobic phase of carbohydrate metabolism and protein degradation.</li> </ul>
	Practical I	BCH3B05 & BCH4B08	<ul style="list-style-type: none"> <li>▪ To provide hands on training in spectroscopic analysis and make them verify the principles involved</li> <li>▪ To impart basic practical skills in quantitative estimation of biomolecules and their separation techniques.</li> </ul>

<b>Fifth Semester</b>	Plant Biochemistry	BCH5B09	<ul style="list-style-type: none"> <li>▪ To equip the students with the basic knowledge of plant cell structure, functions, metabolism,</li> <li>▪ To know about growth regulators and secondary metabolites.</li> </ul>
	Human Physiology	BCH5B10	<ul style="list-style-type: none"> <li>• To provide an understanding of the functions of organ systems and their coordination.</li> <li>• To provide a basic knowledge about the digestion and absorption of various Biomolecules.</li> <li>• To understand about the blood components, synthesis and coagulation process.</li> <li>• To explore the gaseous transport and renal functions.</li> <li>• To introduce the physiological role of some specialized tissues like bone, neuron, muscle and eye.</li> <li>• To familiarize the hormonal control of various physiological functions</li> </ul>
	Immunology & Microbiology	BCH5B11	<ul style="list-style-type: none"> <li>▪ To provide a general introduction to immunology, types and components of the immune system and diseases associated with immune function.</li> <li>▪ To give an idea about cells and organs of immune system</li> <li>▪ To provide a basic knowledge about monoclonal antibodies, vaccines and antigen – antibody interaction</li> <li>▪ To explore antigen processing and presentation pathways</li> <li>▪ To get basic knowledge about autoimmune diseases, hypersensitivity and immunodeficiency diseases</li> <li>▪ To explore complement activation</li> <li>▪ To acquire basic ideas about cancer and transplantation immunology</li> <li>▪ To introduce microbiology, microbial culture and sterilization techniques</li> </ul>

	Intermediary Metabolism II	BCH5B12	<ul style="list-style-type: none"> <li>▪ To study how oxidation is used as a mechanism of energy release from carbohydrates, lipids and amino acids.</li> <li>▪ To understand the aerobic phase of carbohydrate metabolism, fatty acid oxidation and amino acid catabolism, the mechanism by which energy released is stored in high energy molecules and the basics of bioenergetics.</li> <li>• To provide knowledge about how atmospheric carbon is fixed in plant cells by photosynthesis and photo phosphorylation.</li> </ul>
	Practical II	BCH5B013	<ul style="list-style-type: none"> <li>• To make the students familiarize themselves with the various enzymatic and non enzymatic assays used for the diagnosis of defects in organ function and metabolic disorders.</li> </ul>
<b>Sixth semester</b>	Intermediary Metabolism III	BCH6B014	<ul style="list-style-type: none"> <li>• To explore the biosynthetic pathways of carbohydrates, lipids and amino acids</li> <li>• To understand nucleic acid biosynthesis and degradation.</li> </ul>
	Molecular Biology And Genetic Engineering	BCH6B015	<ul style="list-style-type: none"> <li>• To provide basic knowledge on genome organization and the concept of the central dogma</li> <li>• To provide basic knowledge in replication, transcription and translation</li> <li>• To explore the concept of operons and attenuation</li> <li>• To understand about transposons and mechanism of transposition</li> <li>• To study the mutational changes in genetic material and how the systems repair them.</li> <li>• To understand the principles and techniques in genetic engineering and the fundamentals of genetics</li> </ul>

	Clinical & Nutritional Aspects Of Biochemistry	BCH6B016	<ul style="list-style-type: none"> <li>• To furnish knowledge on the basics and principles of clinical laboratory maintenance, clinical samples and their analysis, routine clinical assays, organ function tests and their clinical significance.</li> <li>• To understand the Basic concepts and principles of Clinical Biochemistry, detail on various biological specimens including the process of collection, preservation and storage.</li> <li>• To understand biochemical aspects of certain pathological conditions, especially those due to abnormal metabolism.</li> <li>• To understand the pathophysiological processes responsible for common biochemical disorders such as jaundice, hepatitis etc.</li> <li>• To appreciate the Clinical application of enzymes in diagnosis, Discussion on Isozymes and understanding their role in diagnosis. To study the role of diet for healthy living, principles of nutrition and food safety. Create awareness of different lifestyle diseases increasingly found in present day</li> </ul>
	Practical III	BCH6B018	<ul style="list-style-type: none"> <li>• To equip the students with practical experience on the basic techniques in molecular biology, immunology and nutritional biochemistry.</li> </ul>
	Project	BCH6B019	<ul style="list-style-type: none"> <li>• To familiarize students with research methodology</li> <li>• To make them aware of how to collect relevant bibliographic material from different sources, how to organize it into a suitable form (Introduction, Backgrounds, material and methods, results, conclusion, Bibliography etc.) and how to make it into a written project report.</li> <li>• To familiarize them to present the project work.</li> </ul>

# GENERAL COURSES

## PROGRAMME: B.Sc. BIOCHEMISTRY

Delivery pattern	Paper	Paper Code	Objectives
Third semester	General Course I Biodiversity – Scope And Relevance	A11	<ul style="list-style-type: none"><li>• The students will explore the complexity of biodiversity.</li><li>• Impart knowledge and understanding of types and importance of biodiversity</li><li>• Acquire knowledge about the variety of life within the five kingdoms.</li><li>• understanding the basics of science of biodiversity in an ecological context</li><li>• Learning tools and techniques relevant to inventorying of biological diversity</li><li>• Advanced understanding of biodiversity and conservation biology that is highly valuable both for scientific and management purposes</li></ul>
	General Course II Research Methodology	A12	<ul style="list-style-type: none"><li>• To choose methods appropriate to research aims and objectives</li><li>• To understand the limitations of particular research methods</li><li>• To develop skills in qualitative and quantitative data analysis and presentation</li><li>• To develop advanced critical thinking skills and enhanced writing skills</li><li>• To familiarize article publishing process in national and international journals</li></ul>



<b>Fourth semester</b>	General Course III Natural Resource Management	A 13	<ul style="list-style-type: none"> <li>• To develop a knowledge about natural resources</li> <li>• To understand the concept of sustainable utilization</li> <li>• To understand the complexity of biodiversity</li> <li>• To exhibit a knowledge base in Contemporary practices in natural resource management</li> <li>• To understand the difference between renewable and non-renewable energy sources</li> <li>• To acquire knowledge about the National and international efforts in natural resource management</li> </ul>
	General Course IV Intellectual Property Rights	A14	<ul style="list-style-type: none"> <li>• To recognize the importance of Intellectual Property and</li> <li>• To understand basic concepts of Intellectual Property Rights.</li> <li>• To identify the significance of practice and procedure of Patents.</li> <li>• To make the students to understand the statutory provisions of different forms of IPRs in simple forms.</li> <li>• To learn the procedure of obtaining Patents, Copyrights, Trade Marks &amp; Industrial Design</li> </ul>

**OPEN COURSES**  
**PROGRAMME: B.Sc. BIOCHEMISTRY**

<b>Delivery Pattern</b>	<b>Paper</b>	<b>Paper Code</b>	<b>Objectives</b>
<b>Fifth Semester</b>	Elementary Biochemistry	BCH 5D01	<ul style="list-style-type: none"> <li>• To introduce the basic concepts of Biochemistry</li> <li>• To provide preliminary knowledge on pH, buffers, major biomolecules, cell as the structural and functional unit of life, concept of metabolism and applications of Biochemistry.</li> </ul>
	Life Style Diseases	BCH 5D02	<ul style="list-style-type: none"> <li>• To furnish introduction to major biomolecules</li> <li>• To provide preliminary knowledge on a healthy life style and the characteristics, causes, risk factors diagnosis, prevention, and management of major lifestyle disorders.</li> </ul>
	Clinical Diagnosis Of Common Diseases	BCH 5D03	<ul style="list-style-type: none"> <li>• To provide basic knowledge on the causes, symptoms, organs affected, risk factors, diagnosis and management of major diseases.</li> </ul>

# COMPLEMENTARY COURSE

## PROGRAMME: B.Sc. BIOCHEMISTRY

Delivery Pattern	Paper	Paper Code	Objectives
First Semester	Biochemistry I	BCH1C01	<ul style="list-style-type: none"><li>• To provides General introduction and scope of Biochemistry</li><li>• To understand the structure and basic units of a cell</li><li>• To give a detailed knowledge on biomolecules and its structures</li><li>• To provide information on isomerism of carbohydrates, reactions of proteins and lipids, and characteristics of nucleic acids.</li></ul>
	Biochemistry Practical I	BCH1C05	<ul style="list-style-type: none"><li>• To familiarize with Qualitative analysis of Carbohydrates,proteins</li><li>• To understand general reactions of carbohydrates (mono, di, and polysaccharides) and specific reactions of reducing sugars.</li><li>• To acquire knowledge about osazone reaction of sugars.</li><li>• To familiarize with analysis of biochemical solution containing a single component</li></ul>

<b>Second Semester</b>	Biochemistry II	BCH2C02	<ul style="list-style-type: none"> <li>• To familiarize with the basic concepts of water including pH, pOH etc</li> <li>• To understand the transport systems that work with membrane transport</li> <li>• To understand the body fluids, blood and its characteristics</li> <li>• To familiarize the concepts of methods used in biochemical analysis such as chromatography, electrophoresis and photometry.</li> <li>• To provide the knowledge on principle, procedure and Applications of paper chromatography, HPLC, TLC, SDS-PAGE, spectrophotometers.</li> </ul>
	Biochemistry Practical II	BCH1C05	<ul style="list-style-type: none"> <li>• Knowledge about of preparation of standard solutions, Percentage solutions, molar solutions, and normal solutions</li> <li>• Familiarize with interconversion of concentrations from, gram, milligram, microgram, and ppm, etc.</li> <li>• Explore standardization of pH meter and buffer preparation</li> <li>• Get an idea of Principles of colorimetry and Verification of Beer-Lambert law</li> <li>• Familiarize with the techniques paper chromatography, TLC, SDS-PAGE</li> </ul>

<b>Third Semester</b>	Biochemistry III	BCH3C03	<ul style="list-style-type: none"> <li>• To introduce enzymes and provide knowledge about their classification, nomenclature, specificity, catalytic mechanism and regulation.</li> <li>• To provide the students a detailed understanding of aerobic and anaerobic phase of carbohydrate metabolism.</li> <li>• To understand the basics of bioenergetics.</li> <li>• To provide knowledge about how atmospheric carbon dioxide is fixed by plant cells.</li> </ul>
	Biochemistry Practical III	BCH1C05	<ul style="list-style-type: none"> <li>• To gain knowledge in Quantitative analysis of different biomolecules</li> <li>• To familiarize with method of calculation by plotting graphs</li> </ul>
<b>Fourth Semester</b>	Biochemistry IV	BCH4C04	<ul style="list-style-type: none"> <li>• To explore the metabolic pathways of lipids.</li> <li>• To understand the amino acid catabolism.</li> <li>• To provide a basic knowledge about the central dogma of life.</li> <li>• To familiarize the hormonal control of various physiological functions</li> </ul>
	Biochemistry Practical IV	BCH1C05	<ul style="list-style-type: none"> <li>• To familiarize with Quantitative estimation of Cholesterol , DNA and RNA</li> <li>• To gain knowledge about digestion of starch by salivary amylase</li> </ul>