KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with 'A' Grade – 3.64 CGPA out of 4 (3rd Cycle)

College of Excellence (UGC)

Coimbatore – 641 029

DEPARTMENT OF BIOCHEMISTRY (Aided)

COURSE OUTCOMES (CO)

B.Sc. BIOCHEMISTRY

For the students admitted

In the

Academic Year 2018-2019

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC101		Core Paper 1 – CHEMISTRY OF BIOMOLECULES		
Batch 2018-2019	Semester I	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

1. To learn the chemistry and structure of different biomolecules
2. To understand the biological significance of different biomolecules

Course Outcomes (CO)

K1	CO1	Define the functions and properties of carbohydrates, lipids, amino acids, proteins and nucleic acids
K2	CO2	Classify the biomolecules according to their structures
K3	CO3	Sketch the basic structure of biomolecules and reactions involving them
K4	CO4	Distinguish different types of sugars, fats, amino acids and proteins based on the physical, chemical and biological aspects

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC2CL		C.Pr.1. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester I & II	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the characterization of lipids.
3. To learn the methodology of separation of amino acids by paper chromatography.

Course Outcomes (CO)

K3	CO1	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
K4	CO2	Calculate iodine number of lipids, thereby characterizing them
K5	CO3	Assess the separation technique of amino acids through paper chromatography

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC202		Core Paper 2- BIOANALYTICAL TECHNIQUES		
Batch 2018-2019	Semester II	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

1. To know the various types of buffer systems in blood and plasma and its significance in the maintenance of blood pH.
2. To understand the principle, materials, methods and applications of chromatography, electrophoresis and colorimetry.
3. To detect and measure the radioactivity and explore its role in biological and clinical fields.

Course Outcomes (CO)

K1	CO1	Recall the definition of acids, bases and buffers.
K2	CO2	Describe the various buffer systems present in blood and plasma, and their role in maintaining the blood pH and various bioanalytical techniques.
K3	CO3	Demonstrate the types and procedures of chromatography, electrophoresis and colorimetry.
K4	CO4	Analyze the separated components in the biological samples by chromatography, electrophoresis and colorimetry.

Programme Code:07		B.Sc Biochemistry		
Course Code: 18UBC303		Core Paper III – ENZYMES AND ENZYME TECHNOLOGY		
Batch 2018-2019	Semester III	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To perceive knowledge about enzymes and their kinetics.
2. To study about the coenzymes and their roles in the biological system.
3. To know about the recent enzyme technologies and their applications for diagnostic purpose.

Course Outcomes (CO)

K1	CO1	Remember the role of enzymes in biological system
K2	CO2	Acquire thorough knowledge on the enzyme kinetics and inhibition.
K3	CO3	Deploy the properties and functions of coenzymes and cofactors.
K4	CO4	Analyze the biological importance of immobilized enzymes and biosensors.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC4CM		Title: C.Pr.2 BIOCHEMISTRY		
Batch 2018-2019	Semester III & IV	Hours / Week 3	Total Hours 90	Credits 2

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Recalling the preparation of reagents.
K2	CO2	Understanding the principles of techniques.
K3	CO3	Carrying out the experiments using various techniques.
K4	CO4	Techniques are used to analyse the components both qualitatively and quantitatively.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC404		Core Paper 4 – INTERMEDIARY METABOLISM		
Batch 2018-2019	Semester IV	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn the fate of dietary carbohydrates, proteins and lipids.

2. To study the various catabolic and biosynthetic pathways of biomolecules and their significance.

3. To understand the interrelationship between carbohydrate, protein and fat metabolism.

Course Outcomes (CO)

K1	CO1	Understand the various metabolic pathways of carbohydrate, proteins, fat and nucleic acid metabolism
K2	CO2	Remember the glycolysis, TCA cycle, Glycogenesis, glycogenolysis, β-oxidation, phospholipid biosynthesis, Urea cycle, Nucelic acid biosynthetic pathway and degradation of purine and pyrimidine
K3	CO3	Assessment of Bioenergetics of various metabolism pathways, role of inhibitors and uncouplers in electron transport chain
K4	CO4	Analysis of regulation of various metabolic pathways and their significance

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC4S2		Skill Based Subject II - COMMON HUMAN DISEASES		
Batch 2018-2019	Semester III	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To provide a broad overview of the most common and important human diseases
2. To provide sufficient knowledge about the pathogenesis of common human diseases
3. To address the aspects of diseases, diagnosis and treatment essential to maintain human health

Course Outcomes (CO)

K1	CO1	Recollect the structure and functions of various biological systems.
K2	CO2	Understand the diseases of circulatory, endocrine and hepatic system.
K3	CO3	Describe and understand the pathophysiology of diseases.
K4	CO4	Acquire knowledge about the diseases, diagnosis and treatment essential to maintain human health.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC505		Core Paper 5 – HUMAN PHYSIOLOGY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the basic principles and mechanisms involved during the functioning of various organs of the physiological system.

2. To learn the mechanism of action of hormones, and their role under normal and abnormal conditions of the physiological system.

Course Outcomes (CO)

K1	CO1	Recall of the structure of skeletal muscle, GI tract, lungs, nephrons, neurons and reproductive system
K2	CO2	Understanding the mechanism of muscle contraction,mechanism of buffer action,transport of gases between tissues and blood,formation of urine, propagation of nerve application ,mechanism of action of hormones.
K3	CO3	Explanation of sources of energy for muscle contraction, functions of hormones, spermatogenesis, ovarian cycle, chemical changes during muscle contraction.
K4	CO4	Synaptic transmission of neuro-muscular transmission,pathophysiology of hormones of pituitary,thyroid,parathyroid and adrenal glands.

Programme Code: 07		Biochemistry		
Course Code: 18UBC506		Core Paper 6 – CELL BIOLOGY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Appreciates and understands the dynamic nature of the cell, including how it occurs and response to the information from its environment.
K2	CO2	Remembers the different mechanism of receptor activation and regulation.
K3	CO3	Explores the role of growth hormones in the biological system
K4	CO4	Predict how alterations or given drugs or chemical treatment would impact cell behavior

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC507		Core Paper 7- CLINICAL BIOCHEMISTRY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a conceptual background in Clinical Biochemistry

2. To provide students with an understanding of various types of diseases and their causes, symptoms, prevention, management and treatment

Course Outcomes (CO)

K1	CO1	Recall the metabolism of carbohydrates, lipids and proteins
K2	CO2	Describe the disorders of carbohydrate, lipids, protein and amino acids metabolism & assess the gastric, intestinal, liver and kidney functions
K3	CO3	Demonstrate the types, clinical pathology and diagnosis of disorders of carbohydrate, lipids, protein and amino acids
K4	CO4	Analyze the blood and serum samples for the diagnosis and prognosis of diseases

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC508		Core Paper 8 – MOLECULAR BIOLOGY		
Batch 2018-2019	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the scientific process in the content of learning the fundamental biological and chemical factors of molecular biology.
2. To gain knowledge about DNA replication, DNA repair mechanism and mutation.
3. To understand the mechanism of transcription and reverse transcription.
4. To acquire the knowledge about gene regulation.

Course Outcomes (CO)

K1	CO1	Understand the dynamics of protein synthesis with respect to ribosome structure, function and accuracy of translation
K2	CO2	Remember the Genetic Code and the amino acid which it codes. the role of various enzymes and proteins in DNA replications, transcription and translation
K3	CO3	Advanced and integrated knowledge of the process that occur in DNA recombination and repair process
K4	CO4	Exploit spontaneous and chemically induced mutations

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6CN		C.Pr.3. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester V & VI	Hours / Week 4	Total Hours 120	Credits 3

Course Objectives

1. To make students learn the methods of collection of blood and urine samples and separation of serum

2. To analyze the biochemical parameters in urine and blood samples and indicate their clinical significance

3. To demonstrate the kit methods for the assay of biochemical parameters

Course Outcomes (CO)

K3	CO1	Apply various techniques for the assay of important biochemical parameters and interpret their values
K4	CO2	Calculate the values from the graph obtained in the experiment
K5	CO3	Estimate the level of bilirubin, SGOT, SGPT, LDH, CKMB in the given sample using kit method

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6CO		Title: C.Pr.4. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To isolate plasmid DNA and genomic DNA, isolation and restriction digestion of DNA through demonstration experiments
2. To perform simple staining, gram staining and negative staining, isolation of microbes and biochemical tests for identifying bacteria
3. To demonstrate media preparation, callus initiation in plant tissue and mitosis in onion root tips

Course Outcomes (CO)

K3	CO1	Employ molecular methods in isolation, restriction digestion and separation of DNA
K4	CO2	Analyze microbiological methods of staining, plating and biochemical tests for identifying them
K5	CO3	Familiarize the techniques of plant tissue culture and cell biology through demonstrations

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6CP		C.Pr.5. BIOCHEMISTRY (Lab)		
Batch 2018-2019	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To estimate chlorophyll, starch, total phenols and qualitatively analyze various secondary metabolites in plant sample
2. To determine RA and pregnancy tests using kit method
3. To demonstrate RBC count, total and differential count of WBCs and identifying blood groups

Course Outcomes (CO)

K3	CO1	Practice techniques of different plant component isolation, antigen-antibody interactions in immunological kit methods and identifying blood groups
K4	CO2	Calculate the number of RBC and WBCs
K5	CO3	Estimate chlorophyll, starch and total phenols present in plant sample

Programme Code: 07		For B.Sc Botany, Zoology & Biotechnology		
Course Code: 18UBC5X1		Extra Departmental Course - I - DIAGNOSTIC BIOCHEMISTRY		
Batch 2018-2019	Semester V	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To make the students to know the principles for routinely conducted tests in diagnostic laboratories.
2. To select the appropriate biochemical tests to the diagnosis of the diseases.
3. To enable the students to interpret the laboratory data properly.

Course Outcomes (CO)

K1	CO1	Remember the basic concepts of collection of samples
K2	CO2	Understand the idea about the tests performed using blood, serum and enzymes
K3	CO3	Familiarize with the clinical importance of hormones
K4	CO4	Analyze and execute the clinical laboratory techniques

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC609		Core Paper 9 – PLANT BIOCHEMISTRY		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To deep understanding of metabolic processes in plants and role of various biosynthetic pathway.

2. To acquire knowledge about photosynthetic apparatus, role of nitrogen in plants.

3. To explore the plant growth regulators and their role and roles of secondary metabolites in plants.

Course Outcomes (CO)

K1	CO1	Recollect the structure and function of plant cell.
K2	CO2	Understand the mechanism of photosynthesis in plants.
K3	CO3	Execute the concept of role of minerals and growth hormones in plants.
K4	CO4	Analyze the nature and functions of secondary metabolites.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC610		Core Paper 10 – IMMUNOLOGY AND IMMUNOTECHNIQUES		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn about the basic principles of immunology, functioning of immune system, immunological techniques of clinical and research laboratories.

2. To know about the different types of immune mechanisms involving in various abnormal and diseased conditions.

Course Outcomes (CO)

K1	CO1	Learning the basics of immunity and immune system,formation of cytokinins, different features of antigens and antibodies.
K2	CO2	Understanding of the mechanism of antibody and cell mediated immunity,action of complement system.
K3	CO3	Learning the development of various clinical conditions during thevarious abnormal conditions.
K4	CO4	Application of antigen – antibody reactions in the diagnosis of various infectious diseases using different techniques.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC611		Core Paper 11 – GENETIC TECHNOLOGY		
Batch 2018-2019	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a broad conceptual background in the field of genetic engineering

2. To describe the methods used to create recombinant DNA molecules and introduce them into prokaryotic cells

3. To expose the students to the application of genetic engineering in medicine and agriculture

Course Outcomes (CO)

K1	CO1	Recognize the concept of recombinant DNA technology or genetic engineering
K2	CO2	Describe a range of techniques in gene manipulation, the cloning vectors available and the containment procedures
K3	CO3	Demonstrate the application of transgenic plants with herbicide resistance, virus resistance, pest resistance and male infertility and the production of recombinant insulin
K4	CO4	Examine the difficulties during the expression of eukaryotic DNA in prokaryotes and how to overcome these difficulties

Programme Code: 07		B.Sc Biochemistry		
Course Code: 18UBC6S4		Skill based subject 4– TECHNIQUES IN GENOMICS AND PROTEOMICS		
Batch 2018-2019	Semester VI	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Recollect the organization of the nuclear DNA and mapping
K2	CO2	Get thorough knowledge about human genome project and sequencing
K3	CO3	Update the knowledge about transcriptomics
K4	CO4	Analyze the applications of proteomics in various diseases

Programme Code: 07	B.Sc Biochemistry		
Major Elective – MICROBIOLOGY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide students with a conceptual background in microbiology
2. To provide students with an understanding of various microbiological techniques
3. To make the students to be familiar with the relationship between microbes and human beings

Course Outcomes (CO)

K1	CO1	Recall the characteristics of bacteria, algae, fungi and viruses
K2	CO2	Describe the role of microbes as normal flora and as disease causing agents
K3	CO3	Demonstrate the microscopic techniques, staining and culturing methods
K4	CO4	Analyze the bacteriological examination and purification of drinking water

Programme Code: 07	B.Sc Biochemistry		
Major Elective – Biotechnology			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide knowledge about plant tissue culture and animal tissue culture.
2. To acquire knowledge about various methods of genetic engineering of animal cells.
3. To provide knowledge about gene therapy and *in vitro* fertilization.
4. To know about the different fermentation technologies.

Course Outcomes (CO)

K1	CO1	Understand plant and animal tissue culture technique, Gene therapy, Fermentation technology and Bioremediation
K2	CO2	Remember various media used for tissue culture, types of cultures used in Fermentation technology and Bioremediation
K3	CO4	Implication of genetically modified plants, *invitro* fertilization recombinant vaccines and Downstream process
K4	CO3	Evaluate the merits and demerits of plant and animal tissue culture, Ex-vivo and *invivo* gene therapy

Programme Code: 07	B.Sc Biochemistry		
Major elective -ADVANCED CLINICAL BIOCHEMISTRY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To make the students learn more about the latest techniques in clinical laboratories for diagnosis of different types of diseases.
2. To understanding the abnormal levels of various biochemical parameters in diseased conditions.

Course Outcomes (CO)

K1	CO1	Practice the collection of blood using apparatus
K2	CO2	Understand the clinical significance of abnormal constituents of urine
K3	CO3	Analyze the clinical causes of haemoglobin related diseases
K4	CO4	Evaluate the liver tests using automated instruments

Programme Code: 07	B.Sc Biochemistry		
Major elective –PRINCIPLES OF PHARMACOLOGY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To make the students to understand the basic principles of pharmacology.
2. To learn the concepts regarding the pharmacokinetics, pharmacodynamics and pharmacotherapy.

Course Outcomes (CO)

K1	CO1	Describe the basic principles of pharmacology
K2	CO2	Explain different modes of drug transport, absorption and bioavailability
K3	CO3	Analyze the mechanism of pharmacokinetics and pharmacodynamics of drugs
K4	CO4	Assess the primary aspects of pharmacotherapy

Programme Code: 07	B.Sc Biochemistry		
Major elective- BASICS OF BIOINFORMATICS			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To know about various tools for database search.
2. To acquire knowledge about different biological databases.
3. To provide knowledge about Gene prediction and drug designing.

Course Outcomes (CO)

K1	CO1	Recognize the available bioinformatics resources on web like DNA and protein databases
K2	CO2	Understand concepts of similarity searching databases and algorithms
K3	CO3	Construct genome annotations and algorithms
K4	CO4	Outline the concepts of structure based drug design, protein structure levels and databases

Programme Code: 07	B.Sc Biochemistry		
Major elective- DAIRY BIOCHEMISTRY			
Batch 2018-2019	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To understand the basic concepts of dairy technology.
2. To provide knowledge about the milk processing techniques.

Course Outcomes (CO)

K1	CO1	Recognize the properties of milk.
K2	CO2	Recall the methods of testing density, fat content and acidity of milk.
K3	CO3	Analyze the carbohydrates, lipids, proteins and enzymes present in milk.
K4	CO4	Acquire knowledge about the various milk products available and milk processing techniques practiced.

Programme Code: 07		For B.Sc Zoology		
Course Code: 18UBC3A3		ALLIED BIOCHEMISTRY I		
Batch 2018-2019	Semester III	Hours / Week 5	Total Hours 75	Credits 4

Course Objectives

1. To make the students to understand the basic principles of biochemistry.

2. To learn about the mechanism of action of enzymes in the biological system.

Course Outcomes (CO)

K1	CO1	Understands the properties, types and functions of carbohydrates, proteins, lipids, enzymes, nucleic acids and their and functions.
K2	CO2	Remembers the structures of monosaccharides, dissaccharides and polysaccharides and aminoacids
K3	CO3	Applies the concept of enzymatic activity in biological system.
K4	CO4	Acquire knowledge about the nuclear organization of prokaryotes in eukaryotes.

Programme Code: 07		For B.Sc Zoology		
Course Code: 18UBC4A4		Title: ALLIED BIOCHEMISTRY II		
Batch 2018-2019	Semester IV	Hours / Week 5	Total Hours 75	Credits 4

Course Objectives

1. To learn about the various biochemical techniques applicable in both research and clinical laboratories.

2. To provide knowledge on metabolic reactions involved in biological reactions.

Course Outcomes (CO)

K1	CO1	Remember the concept of pH and buffer system.
K2	CO2	Understand the idea about the working principle of various analytical techniques.
K3	CO3	Deploy the activity of radioisotopes and their applications in biological system.
K4	CO4	Interpret the metabolic pathways of various molecules.

Programme Code: 07		For B.Sc Zoology		
Course Code: 18UBC4AL		A.Pr.2. BIOCHEMISTRY		
Batch 2018-2019	Semester III & IV	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire the skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the characterization of lipids.
3. To learn the methodology of separation of amino acid by paper chromatography.

Course Outcomes (CO)

K3	CO1	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
K4	CO2	Calculate acid and iodine number of lipids, thereby characterizing them
K5	CO3	Assess the separation technique of amino acids through paper chromatography

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DEPARTMENT OF BIOCHEMISTRY (Aided)

COURSE OUTCOMES (CO)

B.Sc. BIOCHEMISTRY

For the students admitted

In the

Academic Year 2019 - 2020

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC101		Core Paper 1 – CHEMISTRY OF BIOMOLECULES		
Batch 2019-2020	Semester I	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

1. To learn the chemistry and structure of different biomolecules
2. To understand the biological significance of different biomolecules

Course Outcomes (CO)

K1	CO1	Define the functions and properties of carbohydrates, lipids, amino acids, proteins and nucleic acids
K2	CO2	Classify the biomolecules according to their structures
K3	CO3	Sketch the basic structure of biomolecules and reactions involving them
K4	CO4	Distinguish different types of sugars, fats, amino acids and proteins based on the physical, chemical and biological aspects

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC2CL		C.Pr.1. BIOCHEMISTRY (Lab)		
Batch 2019-2020	Semester I & II	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the characterization of lipids.
3. To learn the methodology of separation of amino acids by paper chromatography.

Course Outcomes (CO)

K3	CO1	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
K4	CO2	Calculate iodine number of lipids, thereby characterizing them
K5	CO3	Assess the separation technique of amino acids through paper chromatography

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC202		Core Paper 2- BIOANALYTICAL TECHNIQUES		
Batch 2019-2020	Semester II	Hours / Week 7	Total Hours 105	Credits 6

Course Objectives

1. To know the various types of buffer systems in blood and plasma and its significance in the maintenance of blood pH.
2. To understand the principle, materials, methods and applications of chromatography, electrophoresis and colorimetry.
3. To detect and measure the radioactivity and explore its role in biological and clinical fields.

Course Outcomes (CO)

K1	CO1	Recall the definition of acids, bases and buffers.
K2	CO2	Describe the various buffer systems present in blood and plasma, and their role in maintaining the blood pH and various bioanalytical techniques.
K3	CO3	Demonstrate the types and procedures of chromatography, electrophoresis and colorimetry.
K4	CO4	Analyze the separated components in the biological samples by chromatography, electrophoresis and colorimetry.

Programme Code:07		B.Sc Biochemistry		
Course Code: 19UBC303		Core Paper III – ENZYMES AND ENZYME TECHNOLOGY		
Batch 2019-2020	Semester III	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To perceive knowledge about enzymes and their kinetics.
2. To study about the coenzymes and their roles in the biological system.
3. To know about the recent enzyme technologies and their applications for diagnostic purpose.

Course Outcomes (CO)

K1	CO1	Remember the role of enzymes in biological system
K2	CO2	Acquire thorough knowledge on the enzyme kinetics and inhibition.
K3	CO3	Deploy the properties and functions of coenzymes and cofactors.
K4	CO4	Analyze the biological importance of immobilized enzymes and biosensors.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC4CM		Title: C.Pr.2 BIOCHEMISTRY		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	III & IV	3	90	2

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Recalling the preparation of reagents.
K2	CO2	Understanding the principles of techniques.
K3	CO3	Carrying out the experiments using various techniques.
K4	CO4	Techniques are used to analyse the components both qualitatively and quantitatively.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC404		Core Paper 4 – INTERMEDIARY METABOLISM		
Batch 2019-2020	Semester IV	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn the fate of dietary carbohydrates, proteins and lipids.

2. To study the various catabolic and biosynthetic pathways of biomolecules and their significance.

3. To understand the interrelationship between carbohydrate, protein and fat metabolism.

Course Outcomes (CO)

K1	CO1	Understand the various metabolic pathways of carbohydrate, proteins, fat and nucleic acid metabolism
K2	CO2	Remember the glycolysis, TCA cycle, Glycogenesis, glycogenolysis, β-oxidation, phospholipid biosynthesis, Urea cycle, Nucelic acid biosynthetic pathway and degradation of purine and pyrimidine
K3	CO3	Assessment of Bioenergetics of various metabolism pathways, role of inhibitors and uncouplers in electron transport chain
K4	CO4	Analysis of regulation of various metabolic pathways and their significance

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC4S2		Skill Based Subject II - COMMON HUMAN DISEASES		
Batch 2019-2020	Semester III	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To provide a broad overview of the most common and important human diseases
2. To provide sufficient knowledge about the pathogenesis of common human diseases
3. To address the aspects of diseases, diagnosis and treatment essential to maintain human health

Course Outcomes (CO)

K1	CO1	Recollect the structure and functions of various biological systems.
K2	CO2	Understand the diseases of circulatory, endocrine and hepatic system.
K3	CO3	Describe and understand the pathophysiology of diseases.
K4	CO4	Acquire knowledge about the diseases, diagnosis and treatment essential to maintain human health.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC505		Core Paper 5 – HUMAN PHYSIOLOGY		
Batch 2019-2020	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the basic principles and mechanisms involved during the functioning of various organs of the physiological system.

2. To learn the mechanism of action of hormones, and their role under normal and abnormal conditions of the physiological system.

Course Outcomes (CO)

K1	CO1	Recall of the structure of skeletal muscle, GI tract, lungs, nephrons, neurons and reproductive system
K2	CO2	Understanding the mechanism of muscle contraction,mechanism of buffer action,transport of gases between tissues and blood,formation of urine, propagation of nerve application ,mechanism of action of hormones.
K3	CO3	Explanation of sources of energy for muscle contraction, functions of hormones, spermatogenesis, ovarian cycle, chemical changes during muscle contraction.
K4	CO4	Synaptic transmission of neuro-muscular transmission,pathophysiology of hormones of pituitary,thyroid,parathyroid and adrenal glands.

Programme Code: 07		Biochemistry		
Course Code: 19UBC506		Core Paper 6 – Basics of Microbiology and Biotechnology		
Batch	Semester	Hours / Week	Total Hours	Credits
2019-2020	V	4	60	5

Course Objectives

1. To provide students with a conceptual background in microbiology
2. To make the students to be familiar with the relationship between microbes and human beings
3. To provide knowledge about plant tissue culture and animal tissue culture.
4. To know about the different fermentation technologies.

Course Outcomes (CO)

K1	CO1	Recall the characteristics of bacteria, algae, fungi and viruses
K2	CO2	Understand the role of microbes as normal flora and as disease causing agents
K3	CO3	Evaluate the plant and animal tissue culture techniques and role of biotechnology in managing the environmental wastes.
K4	CO4	Analyze the techniques on fermentation, bioreactors, downstream processing and methods on food processing and industrial biotechnology in food and industrial biotechnology

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC507		Core Paper 7- CLINICAL BIOCHEMISTRY		
Batch 2019-2020	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a conceptual background in Clinical Biochemistry

2. To provide students with an understanding of various types of diseases and their causes, symptoms, prevention, management and treatment

Course Outcomes (CO)

K1	CO1	Recall the metabolism of carbohydrates, lipids and proteins
K2	CO2	Describe the disorders of carbohydrate, lipids, protein and amino acids metabolism & assess the gastric, intestinal, liver and kidney functions
K3	CO3	Demonstrate the types, clinical pathology and diagnosis of disorders of carbohydrate, lipids, protein and amino acids
K4	CO4	Analyze the blood and serum samples for the diagnosis and prognosis of diseases

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC508		Core Paper 8 – MOLECULAR BIOLOGY		
Batch 2019-2020	Semester V	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the scientific process in the content of learning the fundamental biological and chemical factors of molecular biology.
2. To gain knowledge about DNA replication, DNA repair mechanism and mutation.
3. To understand the mechanism of transcription and reverse transcription.
4. To acquire the knowledge about gene regulation.

Course Outcomes (CO)

K1	CO1	Understand the dynamics of protein synthesis with respect to ribosome structure, function and accuracy of translation
K2	CO2	Remember the Genetic Code and the amino acid which it codes. the role of various enzymes and proteins in DNA replications, transcription and translation
K3	CO3	Advanced and integrated knowledge of the process that occur in DNA recombination and repair process
K4	CO4	Exploit spontaneous and chemically induced mutations

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC6CN		C.Pr.3. BIOCHEMISTRY (Lab)		
Batch 2019-2020	Semester V & VI	Hours / Week 4	Total Hours 120	Credits 3

Course Objectives

1. To make students learn the methods of collection of blood and urine samples and separation of serum

2. To analyze the biochemical parameters in urine and blood samples and indicate their clinical significance

3. To demonstrate the kit methods for the assay of biochemical parameters

Course Outcomes (CO)

K3	CO1	Apply various techniques for the assay of important biochemical parameters and interpret their values
K4	CO2	Calculate the values from the graph obtained in the experiment
K5	CO3	Estimate the level of bilirubin, SGOT, SGPT, LDH, CKMB in the given sample using kit method

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC6CO		Title: C.Pr.4. BIOCHEMISTRY (Lab)		
Batch 2019-2020	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To isolate plasmid DNA and genomic DNA, isolation and restriction digestion of DNA through demonstration experiments
2. To perform simple staining, gram staining and negative staining, isolation of microbes and biochemical tests for identifying bacteria
3. To demonstrate media preparation, callus initiation in plant tissue and mitosis in onion root tips

Course Outcomes (CO)

K3	CO1	Employ molecular methods in isolation, restriction digestion and separation of DNA
K4	CO2	Analyze microbiological methods of staining, plating and biochemical tests for identifying them
K5	CO3	Familiarize the techniques of plant tissue culture and cell biology through demonstrations

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC6CP		C.Pr.5. BIOCHEMISTRY (Lab)		
Batch 2019-2020	Semester V & VI	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To estimate chlorophyll, starch, total phenols and qualitatively analyze various secondary metabolites in plant sample
2. To determine RA and pregnancy tests using kit method
3. To demonstrate RBC count, total and differential count of WBCs and identifying blood groups

Course Outcomes (CO)

K3	CO1	Practice techniques of different plant component isolation, antigen-antibody interactions in immunological kit methods and identifying blood groups
K4	CO2	Calculate the number of RBC and WBCs
K5	CO3	Estimate chlorophyll, starch and total phenols present in plant sample

Programme Code: 07		For B.Sc Botany, Zoology & Biotechnology		
Course Code: 19UBC5X1		Extra Departmental Course - I - DIAGNOSTIC BIOCHEMISTRY		
Batch 2019-2020	Semester V	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To make the students to know the principles for routinely conducted tests in diagnostic laboratories.
2. To select the appropriate biochemical tests to the diagnosis of the diseases.
3. To enable the students to interpret the laboratory data properly.

Course Outcomes (CO)

K1	CO1	Remember the basic concepts of collection of samples
K2	CO2	Understand the idea about the tests performed using blood, serum and enzymes
K3	CO3	Familiarize with the clinical importance of hormones
K4	CO4	Analyze and execute the clinical laboratory techniques

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC609		Core Paper 9 – PLANT BIOCHEMISTRY		
Batch 2019-2020	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To deep understanding of metabolic processes in plants and role of various biosynthetic pathway.

2. To acquire knowledge about photosynthetic apparatus, role of nitrogen in plants.

3. To explore the plant growth regulators and their role and roles of secondary metabolites in plants.

Course Outcomes (CO)

K1	CO1	Recollect the structure and function of plant cell.
K2	CO2	Understand the mechanism of photosynthesis in plants.
K3	CO3	Execute the concept of role of minerals and growth hormones in plants.
K4	CO4	Analyze the nature and functions of secondary metabolites.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC610		Core Paper 10 – IMMUNOLOGY AND IMMUNOTECHNIQUES		
Batch 2019-2020	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To learn about the basic principles of immunology, functioning of immune system, immunological techniques of clinical and research laboratories.

2. To know about the different types of immune mechanisms involving in various abnormal and diseased conditions.

Course Outcomes (CO)

K1	CO1	Learning the basics of immunity and immune system,formation of cytokinins, different features of antigens and antibodies.
K2	CO2	Understanding of the mechanism of antibody and cell mediated immunity,action of complement system.
K3	CO3	Learning the development of various clinical conditions during thevarious abnormal conditions.
K4	CO4	Application of antigen – antibody reactions in the diagnosis of various infectious diseases using different techniques.

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC611		Core Paper 11 – GENETIC TECHNOLOGY		
Batch 2019-2020	Semester VI	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To provide students with a broad conceptual background in the field of genetic engineering

2. To describe the methods used to create recombinant DNA molecules and introduce them into prokaryotic cells

3. To expose the students to the application of genetic engineering in medicine and agriculture

Course Outcomes (CO)

K1	CO1	Recognize the concept of recombinant DNA technology or genetic engineering
K2	CO2	Describe a range of techniques in gene manipulation, the cloning vectors available and the containment procedures
K3	CO3	Demonstrate the application of transgenic plants with herbicide resistance, virus resistance, pest resistance and male infertility and the production of recombinant insulin
K4	CO4	Examine the difficulties during the expression of eukaryotic DNA in prokaryotes and how to overcome these difficulties

Programme Code: 07		B.Sc Biochemistry		
Course Code: 19UBC6S4		Skill based subject 4– TECHNIQUES IN GENOMICS AND PROTEOMICS		
Batch 2019-2020	Semester VI	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To perceive knowledge about structure of animal cell membrane and its function.

2. To study about the mechanism of protein sorting and transport in the biological system.

3. To know about the cell cycle and about cancer development.

Course Outcomes (CO)

K1	CO1	Recollect the organization of the nuclear DNA and mapping
K2	CO2	Get thorough knowledge about human genome project and sequencing
K3	CO3	Update the knowledge about transcriptomics
K4	CO4	Analyze the applications of proteomics in various diseases

Programme Code: 07	B.Sc Biochemistry		
Major Elective – MICROBIOLOGY			
Batch 2019-2020	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide students with a conceptual background in microbiology
2. To provide students with an understanding of various microbiological techniques
3. To make the students to be familiar with the relationship between microbes and human beings

Course Outcomes (CO)

K1	CO1	Recall the characteristics of bacteria, algae, fungi and viruses
K2	CO2	Describe the role of microbes as normal flora and as disease causing agents
K3	CO3	Demonstrate the microscopic techniques, staining and culturing methods
K4	CO4	Analyze the bacteriological examination and purification of drinking water

Programme Code: 07	B.Sc Biochemistry		
Major Elective – Biotechnology			
Batch 2019-2020	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To provide knowledge about plant tissue culture and animal tissue culture.
2. To acquire knowledge about various methods of genetic engineering of animal cells.
3. To provide knowledge about gene therapy and *in vitro* fertilization.
4. To know about the different fermentation technologies.

Course Outcomes (CO)

K1	CO1	Understand plant and animal tissue culture technique, Gene therapy, Fermentation technology and Bioremediation
K2	CO2	Remember various media used for tissue culture, types of cultures used in Fermentation technology and Bioremediation
K3	CO4	Implication of genetically modified plants, *invitro* fertilization recombinant vaccines and Downstream process
K4	CO3	Evaluate the merits and demerits of plant and animal tissue culture, Ex-vivo and *invivo* gene therapy

Programme Code: 07	B.Sc Biochemistry		
Major elective -ADVANCED CLINICAL BIOCHEMISTRY			
Batch 2019-2020	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To make the students learn more about the latest techniques in clinical laboratories for diagnosis of different types of diseases.
2. To understanding the abnormal levels of various biochemical parameters in diseased conditions.

Course Outcomes (CO)

K1	CO1	Practice the collection of blood using apparatus
K2	CO2	Understand the clinical significance of abnormal constituents of urine
K3	CO3	Analyze the clinical causes of haemoglobin related diseases
K4	CO4	Evaluate the liver tests using automated instruments

Programme Code: 07	B.Sc Biochemistry		
Major elective –PRINCIPLES OF PHARMACOLOGY			
Batch 2019-2020	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To make the students to understand the basic principles of pharmacology.
2. To learn the concepts regarding the pharmacokinetics, pharmacodynamics and pharmacotherapy.

Course Outcomes (CO)

K1	CO1	Describe the basic principles of pharmacology
K2	CO2	Explain different modes of drug transport, absorption and bioavailability
K3	CO3	Analyze the mechanism of pharmacokinetics and pharmacodynamics of drugs
K4	CO4	Assess the primary aspects of pharmacotherapy

Programme Code: 07	B.Sc Biochemistry		
Major elective- BASICS OF BIOINFORMATICS			
Batch 2019-2020	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To know about various tools for database search.
2. To acquire knowledge about different biological databases.
3. To provide knowledge about Gene prediction and drug designing.

Course Outcomes (CO)

K1	CO1	Recognize the available bioinformatics resources on web like DNA and protein databases
K2	CO2	Understand concepts of similarity searching databases and algorithms
K3	CO3	Construct genome annotations and algorithms
K4	CO4	Outline the concepts of structure based drug design, protein structure levels and databases

Programme Code: 07	B.Sc Biochemistry		
Major elective- DAIRY BIOCHEMISTRY			
Batch 2019-2020	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To understand the basic concepts of dairy technology.
2. To provide knowledge about the milk processing techniques.

Course Outcomes (CO)

K1	CO1	Recognize the properties of milk.
K2	CO2	Recall the methods of testing density, fat content and acidity of milk.
K3	CO3	Analyze the carbohydrates, lipids, proteins and enzymes present in milk.
K4	CO4	Acquire knowledge about the various milk products available and milk processing techniques practiced.

Programme Code: 07		For B.Sc Zoology		
Course Code: 19UBC3A3		ALLIED BIOCHEMISTRY I		
Batch 2019-2020	Semester III	Hours / Week 5	Total Hours 75	Credits 4

Course Objectives

1. To make the students to understand the basic principles of biochemistry.

2. To learn about the mechanism of action of enzymes in the biological system.

Course Outcomes (CO)

K1	CO1	Understands the properties, types and functions of carbohydrates, proteins, lipids, enzymes, nucleic acids and their and functions.
K2	CO2	Remembers the structures of monosaccharides, dissaccharides and polysaccharides and aminoacids
K3	CO3	Applies the concept of enzymatic activity in biological system.
K4	CO4	Acquire knowledge about the nuclear organization of prokaryotes in eukaryotes.

Programme Code: 07		For B.Sc Zoology		
Course Code: 19UBC4A4		Title: ALLIED BIOCHEMISTRY II		
Batch 2019-2020	Semester IV	Hours / Week 5	Total Hours 75	Credits 4

Course Objectives

1. To learn about the various biochemical techniques applicable in both research and clinical laboratories.

2. To provide knowledge on metabolic reactions involved in biological reactions.

Course Outcomes (CO)

K1	CO1	Remember the concept of pH and buffer system.
K2	CO2	Understand the idea about the working principle of various analytical techniques.
K3	CO3	Deploy the activity of radioisotopes and their applications in biological system.
K4	CO4	Interpret the metabolic pathways of various molecules.

Programme Code: 07		For B.Sc Zoology		
Course Code: 19UBC4AL		A.Pr.2. BIOCHEMISTRY		
Batch 2019-2020	Semester III & IV	Hours / Week 2	Total Hours 60	Credits 2

Course Objectives

1. To acquire the skill of analyzing carbohydrates and amino acids.
2. To provide practical knowledge about the characterization of lipids.
3. To learn the methodology of separation of amino acid by paper chromatography.

Course Outcomes (CO)

K3	CO1	Practice the qualitative analysis of different carbohydrates and amino acids through individual experiments
K4	CO2	Calculate acid and iodine number of lipids, thereby characterizing them
K5	CO3	Assess the separation technique of amino acids through paper chromatography