DEPARTMENT OF BIOCHEMISTRY

GOVERNMENT ZIRTIRI RESIDENTIAL SCIENCE COLLEGE

BACHELOR OF SCIENCE- BIOCHEMISTRY

COURSE OBJECTIVES AND OUTCOMES

OBJECTIVE OF THE COURSE

Biochemistry, the study of biological phenomena at cellular and molecular level, is studied to gain knowledge about the principles that govern complex biological systems. The primary objective of this course is to give students a solid foundation in biochemical processes, to develop analytical, technical and critical thinking skills and to make them scientifically literate so as to contribute to the discipline after graduation.

BCHEM/I/EC/01: INTRODUCTION TO BIOCHEMISTRY

Objective: *The course is designed to give students basic concepts of biochemistry and its nature of interdisciplinary importance. To let students understand the physical and chemical properties of molecules, and their status of occurrence in biological system.*

Course outcomes: *on completion of the course, student will be able to understand:*

- *nature of biochemistry*
- *physical and chemical properties of molecules as a linkage of biochemistry*
- *concept and properties of acid-base relationship*

BCHEM /I/EC/02: PRACTICAL – I

Objective: *To expose students in basic biochemistry practical laboratory to see basic tools used in practical. To acquire confidence, interest, challenge and discipline laboratory behaviour in biochemistry practical.*

Course outcome: *on completion of the course students will be able to:*

- *use simple laboratory instruments for carrying out practical.*
- *do calculations based on the experiment.*
- *understand acid-base interaction.*
- *understand the importance of following safety measures during every practical.*
- *Prepare solutions and reagents.*

BCHEM /II/EC/03: BIOMOLECULES

Objective: *To familiarize the students with major biomolecules namely carbohydrates, lipids, proteins and nucleic acids which are important for the structural organization and functions of the cells. The course encompasses the overall perspective on the biomolecules their characteristic properties and organization in carrying out all the living functions which constitute the life.*

Course Outcome: *On completion of the course, students shall be able to:*

- *assess and relate the concepts of chemistry to biology.*
  identify the structures of amino acids, their chemical properties and their organization into polypeptides and proteins.
- *understand the structure and functions of fundamental mono, di and trisaccharide and polysaccharides. Relate the basic function of nucleotides, structure of different classes of lipids and their roles in biological systems*

BCHEM /II/EC/04: PRACTICAL –II

Objective: *The course gives an idea for the maintenance of laboratory and the practices that should be accomplished in a laboratory. The course explains how to prepare solutions and reagents, various methods of qualitative tests for proteins, carbohydrates and lipids.*

Course Outcome: *At the end of practical course, students will be able to carry out:*

- *qualitative tests for biomolecules, viz, proteins, carbohydrates, lipids.*
- *the students will equip themselves with the basic biochemistry techniques which can later applied for their laboratory research and also for many other industrial researches.*

BCHEM /III/EC/05: ENZYMOLOGY & BIOENERGETICS

Objective*: The course is designed to enable students understand enzymes, properties, mechanism of action and regulation of their activity. To acquaint students grasp the basic cascades of energy transfer system and subsequent products in biology. The course will help the students understand fundamental energetics of biochemical processes, their functionalities.*

Course Outcome: *On completion of the course, students shall be able to:*

- *understand enzymes and how they catalyse reactions as well as enzyme kinetics.*
- *plan and carry out simple experiments on enzymes and physiology.*
- *Understand mechanism and concept of bioenergetics in cell biology*
- *Clear thermodynamics in relation to biological aspects*
- *Project carrying research works in M.Phil and PhD course.*

BCHEM III/EC/06: PRACTICAL –III

Objective: *The course seeks to provide understanding and applied knowledge of medical lab related biochemical tests. To understand the significance of enzyme reactions.*

Course Outcome: *At the end of practical course, students will be able to:*

- *carry out and understand enzymatic reactions*
- *understand factors affecting enzyme reactions*

BCHEM /IV/EC/07: INTERMEDIARY METABOLISM

Objective: *This course aims to develop a thorough knowledge among the students about metabolism. To enable students visualize energy production and utilisation in biological processes. The course gives metabolism of different biomolecules that can help students in understanding chemical pathway living system.*

Course Outcome: *On completion of the course, students shall be able to:*

- *identify and present relevant information from research publications dealing with issues of metabolism.*
- *assess and relate the information to the context of metabolism.*
- *understand the structure, catabolism & anabolism of biomolecules; interrelations, regulation & malfunction of the pathways associated with carbohydrate, protein, nucleotide and lipid metabolism.*

BCHEM /IV/EC/08: PRACTICAL -IV

Objective: *To train students on the basic techniques of biochemistry. The course gives hands on training on the practical experiments and techniques relating to metabolism in biochemistry.*

Course Outcomes: *At the end of this course,*

- *students will be able to analyse metabolic problems and will be able to approach a research problem specifically.*
- *will also help in understanding the significance of biochemical tests.*
- *Students will be able to carry biomolecular estimation based on the coloration reaction.*

BCHEM /V/CC/09: BIOCHEMICAL TECHNIQUES

Objective: *The course is designed to train the students in biophysics and bioinstrumentation techniques essential for the understanding of life sciences and biotechnology. It is designed to make students get an idea on design of experiment using biophysical techniques. To make aware students giving the indispensability importance of modern techniques in biophysical research and living.*

Course outcome: *On completion of the course, students will be able to understand:*

- *biophysical techniques for carrying out research in life sciences.*
- *planning of experiment based on biophysical tools.*
- *microscopic observation and technique used in relation to immunology.*

BCHEM /V/CC/10: PRACTICAL –V

Objective: *The course is designed to offer different application of biochemical techniques critical in biological research. Students will be able to understand buffering system. Students will also learn techniques for protein separation and estimation.*

Course Outcome: *At the end of practical course, students will be able to carry out:*

- *separation of biomolecules using simple biochemical technique*
- *estimation of biomolecules*
- *practical based on microscopic observations.*

BCHEM /V/CC/11: MICROBIOLOGY & IMMUNOLOGY

Objectives: *The course is to introduce origin of microbiology, contribution of various scientists in the origin of microbiology. It will also give various salient features of microbes and the different methods of microbial culture techniques. This course is designed to impart the students the importance of immunology and its theoretical aspects and on the principles of immunology and immune technology. The application of immunology in medicines is also dealt with. It also explains the various antigen-antibody reactions involved in diseases, stem cell technology and vaccine development.*

Course Outcome: *At the end of the course the students will able to understand:*

- *origin of microbiology*
- *concept of microbial diversity and features*
- *culturing techniques and factors controlling microbial growth*
- *immune system and its concept*
- *antigen- antibody interaction system*
- *vaccines*

BCHEM /V/CC/12: PRACTICAL – VI

Objective: *The course will feed students understanding towards agglutination reactions in blood typing. They will be able to handle microbial culture and identification.*

Course outcome*: At the end of the course, students will be able to carry out:*

- *blood typing*
- *microbial culture media preparation*
- *isolation of microbes from the culture*
- *staining and screening of microbes*

BCHEM /V/CC/13: PHYSIOLOGICAL CHEMISTRY

Objective*: To acquaint students with various aspects of physiological actions of selected organs which can be explained by particular biochemical processes. To understand fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body.*

Course Outcome: *On completion of the course, students shall be able to:*

- *gain knowledge on how the human body works and the importance of blood and its components and their interactions during a disease or imbalances.*
- *plan and carry out simple experiments on physiology.*

BCHEM /V/CC/14: PRACTICAL – VII

Objective: *Physiology being at the core of medicine and health sciences, the study of the basic physiological tests will provide a thorough understanding of normal body functions. This course will equip the students to understand the experimental scientific disciplines for enabling a more effective diagnosis of abnormal or disease states.*

Course outcome: *On completing this course, the students will be able:*

- *to determine the various blood groups and the Rh status*
- *estimate the level of haemoglobin in blood.*
- *count WBC and RBC in blood and therefore identify their abnormal concentrations*
- *study about hormones based on biochemical tests*

BCHEM /V/CC/15 (a): CELL & MEMBRANE BIOLOGY

Objective: *The study of cell biology aims to increase understanding of living systems and to consider the systems in relationship to the self and other organisms in the natural environment. The course gives the life activities at cellular and molecular level and basic functions of the various cellular compartments and organelles. This course also aims to develop knowledge among the students about signalling system in cell.*

Course Outcome: *On completion of the course, students shall be able to:*

- *identify and present relevant information from research publications dealing with issues of cell biology.*
- *assess and relate the information to the context of cell biology.*
- *gain knowledge on cell division and regulation*
- *plan and carry out simple experiments on the basis of cell.*

BCHEM /V/CC/15 (b): GENETICS

Objective: *The course is designed to explain the basic principles of Mendelian, population genetics and heredity and gives an overview on the classical genetics- Linkage & Crossing over, alleles, cytogenetics and evolutionary genetics.*

Course outcome: *At the end of this course, students will be able to understand:*

- *concept of Mendelism and inheritance*
- *linkage, crossing over and cytogenetics*
- *genetics problems and allelic variations*
- *genetics of evolution.*

BCHEM /V/CC/16: Project – I

Practical/Project

Objective: *In order to gain practical knowledge on the theory they have studied, students will allow to conduct project work under the supervision of expertise teacher(s). Work plan will be made in which students will carry out experiment according to the objective of the project work.*

Course outcome: *On completion of the course, students will be able to understand:*

- *the atmosphere of research*
- *challenge of basic sciences in life sciences*
- *importance of research in the development of global community*

BCHEM /VI/CC/17: CLINICAL BIOCHEMISTRY

Objectives: *Students will learn about the normal constituents of urine, blood and their significance in maintaining good health. Students will become aware with the variations in the levels of triglycerides and lipoproteins and their relationship with various diseases. Students will get acquainted with the role of enzymes in diagnosis of various diseases.*

Course outcome: *At the end of the course, the students will be able to:*

- *gain knowledge about the concepts of clinical biochemistry*
- *understand about the different biological samples, their collection and preservation*
- *develop an insight on the role of enzymes in diagnosis of certain diseases*
- *gain the importance of metabolism in understanding various diseases*

BCHEM /VI/CC/18: PRACTICAL - VIII

Objective: *The course is designed to help the students to understand the mechanisms of causation of liver, kidney and other diseases based on biochemical tests.*

Course outcome: *The learning outcomes include:*

- *qualitative and quantitative analysis of constituents of biological fluids such as urine, blood and their estimation using standard methods*

BCHEM /VI/CC/19: NUTRITIONAL BIOCHEMISTRY

Objective*: To provide information on concept of nutrition & health and understand the physiological and biochemical significance of micronutrients and macronutrients. This course will also help the student to know the clinical aspects of various disorders due to deficiency of nutrients.*

Course outcome: *At the end of the course, the students will be able to:*

- *understand the importance of nutrition, balance diet.*
- *gain knowledge on biochemical basis of digestion, absorption and transport of nutrients.*
- *gain knowledge by which mechanisms the nutritional related diseases arise.*

BCHEM /VI/CC/20: PRACTICAL-IX

Objective: *The course is designed to provide students thorough ideas on food analysis and determination of minerals and vitamins in various foods.*

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

- *acquire expertise in calculation of BMI/BMR*
- *carry out analysis of different food samples.*
- *gain knowledge on detecting food adulterants and other food components.*

BCHEM /VI/CC/21: MOLECULAR BIOLOGY

Objective: *The course explains the fundamental aspects of gene and genome organization to get basic knowledge to students. It also explains various molecular events in cell so that students can interestingly learn and project molecular status within the cell. The course gives an in-depth insight into the molecular aspects of life - the central dogma.*

Course Outcome: *On completion of the course, students shall be able to:*

- *identify and present relevant information dealing with issues of molecular biology.*
- *get an idea about the principles behind molecular biology which makes students to understand the basic molecular events in the cell.*
- *Understand occurrence of error and repair system in DNA.*

BCHEM /VI/CC/22: PRACTICAL - X

Objectives: *To understand the basics of molecular biology. To learn different methodologies in molecular biology. To enable students to design a cloning experiment and plant genetic improvement.*

Outcome Course*: At the end of the course, student will able to conduct:*

- *isolation of DNA from biological samples*
- *quantification of DNA samples*
- *amplification of DNA and analysis of amplified products.*

BCHEM /VI/CC/23 (a): GENETIC ENGINEERING & BIOTECHNOLOGY

Objective: *The course is designed to illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences. It will give students exposure to application of recombinant DNA technology in biotechnological research, giving ideas in strategizing research methodologies employing genetic engineering techniques. It will also give introduction to the various transformation techniques employed in plant system and application of genetically modified plants in the various fields of science.*

Course Outcome: *On completion of the course, students will be able to understand:*

- *concept of recombinant DNA technology*
- *tools and technique used in rDNA technology*
- *identification of cloned gene*
- *application of recombinant DNA technology in various fields*

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BCHEM /VI/CC/23 (b): ENVIRONMENTAL BIOCHEMISTRY

Objective: *The course gives an introduction to the various aspects of environmental Biochemistry and explains the various applications of Biochemistry in the management and conservation of the environment. It also tries to explain the various environmental problems in terms of their Biochemical processes.*

Course Outcome: *On Completion of the course, the students will:*

- *obtain knowledge on basic principles and technologies of various contaminants and their management by means of biological approaches.*
- *know about the principles underpinning the application of biosciences to the environment.*

BCHEM /VI/CC/24: Project – II/Education Tour/Field Trip

Course objective: *The purpose of educational tour/ field trip is usually observation for education, non- experimental research. It will provide students an experience outside the classroom and laboratory.*

Course outcome: *On completion of the course, students will be able to understand/gain:*

- *The atmosphere of research*
- *Experience outside their everyday learning and activities*