

ISLAMIAH WOMEN'S ARTS AND SCIENCE COLLEGE

Permanently Affiliated to Thiruvalluvar University Recognized by UGC under section 2(f) and 12(B) of UGC Act 1956 Accredited with "B" Grade by NAAC Approved by the Government of Tamil Nadu Phone:04174-235266 Email:principaliwc@gmail.com www.islamiahwomensartsandsciencecollege.com

# PG DEPARTMENT OF BIOCHEMISTRY

# ACADEMIC YEAR 2023-2024

### **B.SC., BIOCHEMISTRY**

#### **PROGRAM OUTCOMES**

**PO1:** Acquire knowledge in Biochemistry and apply the knowledge in their day to day life for betterment of self and society

PO2: Develop critical, analytical thinking and problem solving skills

**PO3:** Develop research related skills in defining the problem, formulate and test the hypothesis, analyse, interpret and draw conclusion from data

**PO4:** Address and develop solutions for societal and environmental needs of local, regional and national development

PO5: Work independently and engage in lifelong learning and enduring proficient progress

**PO6:** Provoke employability and entrepreneurship among students along with ethics and communication skills

## **PROGRAMME SPECIFIC OUTCOMES**

**PSO1:** Comprehend the knowledge in the biochemical, analytical, biostatistical and computational areas

**PSO2:** Ability to understand the technical aspects of existing technologies that help in addressing the biological and medical challenges faced by human kind

**PSO3:** Acquiring analytical and hands on skills to perform research in multidisciplinary environments

**PSO4:** Use library search tools and online databases and sources to locate and retrieve scientific information about a topic and techniques related to biochemistry

# **SEMESTER I**

# NUTRITIONAL BIOCHEMISTRY

CO1: Cognizance of basic food groups viz. Carbohydrates, proteins

and lipids and their nutritional aspects as well as calorific value

CO2: Identify and explain nutrients in foods and the specific functions in maintaining health.

- CO3: Classify the food groups and its significance
- CO4: Understand the effect of food additives
- CO5: Describe the importance of nutraceuticals and pigments

#### PRACTICAL 1- NUTRITIONAL BIOCHEMISTRY Credits: 5

**CO1:** Estimate the important biochemical constituents in the food samples.

**CO2:** Prepare the macronutrients from the rich sources.

CO3: Determine the ash and moisture content of the food samples

CO4: Extract oil from its sources

#### SKILL ENHANCEMENT COURSE1- HEALTH AND NUTRITION Credits: 3

CO1: Understand about the importance of health and diet

CO2: Discuss about the classification properties and deficiencies of vitamins

CO3: Understand about sources and functions of fats and lipids on health

CO4: Detail about the different typed of minerals and its role in health

CO5: Relate the role of proteins and carbohydrates on health

#### **SEMESTER II**

#### **CELL BIOLOGY**

**CO1**: Explain the structure and functions of basic components of Prokaryotic and Eukaryotic cells, especially the organelles.

CO2: Familiarize the Cytoskeleton and Chromatin

**CO3:** Illustrate the structure, composition and functions of cell membrane related to membrane transport

**CO4:** Elaborate the phases of Cell cycle and Cell division- Mitosis and Meiosis and characteristics of cancer cells.

CO5: Relate the structure and biological role of extracellular matrix in cellular interactions

# PRACTICAL II: CELL BIOLOGY

**CO1.** Identify the parts of Microscope.

CO2. Preparation of Slides

CO3. Identify the stages of Mitosis & Meiosis

CO4. Visualize Nucleus and Mitochondria by staining methods

CO5. Identify the spotters of cells, organelles and stages of Cell division

### SKILL ENHANCEMENT COURSE2- MEDICINAL DIET

CO1: Possess basic knowledge about diet

### Credits: 5

#### Credits: 5

CO2: Sketch diet plan for GI diseases

CO3: Sketch diet plan for liver diseases

CO4: Sketch a diet plan for Infectious diseases

CO5: Prepare diet chart for Diabetes Renal and Cardio- vascular diseases

#### M.Sc., BIOCHEMISTRY

**PO1.** To make students understand the importance of biochemistry as a subject that deals with life processes, as well as the concepts, theories and experimental approaches followed in biochemistry, in order to pursue a research career, either in an industry or academic setting. **PO2.** To develop analytical and problem-solving skills

**PO3.** To create an awareness among the students on the interconnection between the interdisciplinary areas of biochemistry.

PO4. To give the necessary practical skills required for biochemical techniques and analysis.

PO5. To develop a communication and writing skills in students.

PO6. To develop leadership and teamwork skills

**PO7.** To emphasize the importance of good academic and work ethics and their social implications.

**PO8.** To emphasize the importance of continuous learning and to promote lifelong learning and career development.

**PO9.** To teach students how to retrieve information from a variety of sources, including libraries, databases and the internet.

**PO10.** To teach students to identify, design and execute a research problem, analyze and interpret data and learn time and resource management.

#### **PROGRAMME SPECIFIC OUTCOME**

**PSO1**. Understand the principles and methods of various techniques in Biochemistry, Immunology, Microbiology, Enzyme kinetics and Molecular Cell Biology. Based on their understanding, the students may would be able to design and execute experiments during their final semester project, and further research programs.

**PSO2.** Insight on the structure-function relationship of biomolecules, their synthesis and breakdown, the regulation of these pathways, and their importance in terms of clinical correlation. Students will also acquire knowledge of the principles of nutritional biochemistry and also understand diseases and their prevention.

**PSO3**. To understand the concepts of cellular signal transduction pathways and the association of aberrant signal processes with various diseases. Acquire insight into the immune system and its responses, and use this knowledge in the processes of immunization, vaccine development, transplantation and organ rejection.

**PSO4.** To visualize and appreciate the central dogma of molecular biology, regulation of gene expression, molecular techniques used in rDNA technology, gene knock-out and knock-in techniques.

**PSO5.** To create awareness in students about the importance of good laboratory practices and the importance of ethical and social responsibilities of a researcher. Teach them how to review literature and the art of designing and executing experiments independently and also work as a part of a team.

#### **SEMESTER I**

#### **BASICS OF BIOCHEMISTRY**

#### **CO1**: Explain the chemical structure and functions of carbohydrates.

**CO2:** Using the knowledge of lipid structure and function, explain how it plays a role in Signaling pathways

**CO3:** Describe the various levels of structural organization of proteins and the role of proteins in biological system

CO4: Apply the knowledge of proteins in cell-cell interactions.CO5: Applying the knowledge of nucleic acid sequencing in research and diagnosis

#### BIOCHEMICAL AND MOLECULAR BIOLOGY TECHNIQUES Credits: 5

**CO1**: Attain good knowledge in modern used in biochemical investigation and microscopy and apply the experimental protocols to plan and carry out simple investigations in biological research.

**CO2:** Demonstrate knowledge to implement the theoretical basis of chromatography in upcoming practical course work.

**CO3:** Demonstrate knowledge to implement the theoretical basis of electrophoretic techniques in research work.

**CO4:** Tackle more advanced and specialized spectroscopic techniques that are pertinent to research.

**CO5:** Tackle more advanced and specialized radioisotope and centrifugation techniques that are pertinent to research work.

# LABORATORY COURSE ON BIOMOLECULES AND BIOCHEMICAL TECHNIQUES Credits: 5

**CO1:** The student will be able to acquire knowledge and skill in the techniques used in the isolation, purification and estimation of different biomolecules that are widely employed in research

**CO2:** The students will get acquainted with Principle, Instrumentation and method of Performing UV absorption studies of DNA, Protein and interpreting the alteration occurred

during the process of denaturation

**CO3:** The student will be fine-tuning in handling the instruments like colorimeter, spectrophotometer and will be able to estimate the biomolecules and minerals from the given samples

CO4: The student, in addition to acquiring skill in performing various biochemical techniques can also learn to detect presence of phytochemicals and quantify them in the plant sample.CO5: The students will develop skill in analytical techniques like subcellular fractionation, Paper, Column and Thin layer Chromatography and the group experiments will enable them to build learning skills like team work, Problem solving, Communication ability.

# **ELECTIVE PAPER**

#### A.MICROBIOLOGY & IMMUNOLOGY

#### Credits: 3

**CO1.** To classify (by both ancient and modern modes) different types of microorganisms and explain life cycle of the microbes

**CO2.** To recognize the microorganisms involved in decay of foods and will be able to apply various counteracting measures. The students also will be able to relate the role of certain beneficial microbes in day-to- day's food consumption.

**CO3.** To understand the common pathogenic bacterial and fungi that cause toxic effects and also will be able to employ curative measures.

**CO4.** To analyze various features of wide variety of antimicrobial agents along with their mode of action, in addition, being able to apprehend the valuable potentials of traditional and easily available herbs.

**CO5.** To apply knowledge gained in production of industrially important products as both pharmaceutical and nutraceutical.

# B.ENERGY AND DRUG METABOLISM Credits: 3

**CO1.** Appreciate the relationship between free energy and redox potential and will be able to justify the role of biological oxidation and energy rich compounds in maintaining the energy level of the system

CO2. Gain knowledge on role of mitochondria in the production of energy currency of the cell

CO3. Acquaint with the process of photosynthesis

**CO4.** Comprehend on the diverse role of TCA cycle and the energy obtained on complete oxidation of glucose and fatty acid

CO5. Correlate the avenues available to metabolize the xenobiotics

#### **SEMESTER II**

#### ENZYMOLOGY

#### Credits: 5

**CO1:** Describe the catalytic mechanisms employed by enzymes

**CO2:** Choose and use the appropriate methods to isolate and purify enzymes and check the purity of the enzyme

**CO3:** Analyze enzyme kinetic data graphically, calculate kinetic parameters, determine the mechanism of inhibition by a drug/chemical and analyze options for applying enzymes and their inhibitors in medicine

**CO4:** Explain allosterism and cooperativity and differentiate Michaelis-Menten kinetics from sigmoidal kinetics. The role played by enzymes in the regulation of vital cellular processes will be appreciated.

CO5: Highlight the use of enzymes in industries and biomedicine

#### **CELLULAR METABOLISM**

#### Credits: 5

**CO1.** Appreciate the modes of synthesis and degradation of glucose and will be able to justify the pros and cons of maintain the blood sugar level

CO2. Gain knowledge on polysaccharide metabolism and glycogen storage disease

CO3. Acquaint with the making and braking of nucleotides

**CO4.** Differentiate the diverse reaction a particular amino acid can experience

**CO5.** Correlate the disturbance of metabolic reactions to clinical manifestations with reference to heme and sulphur metabolism

## LAB COURSE IN ENZYMOLOGY, MICROBIOLOGY AND CELL BIOLOGY Credits: 5

CO1.The student will be able to employ the relevant techniques for isolation and purification of enzymes and gain skill in kinetic studies which is essential for research activityCO2. Student will acquire ability in performing enzyme assay, and explicate the methods that form the basis of enzyme characterization.

**CO3.** Learn the Basic concepts in microbiology and cell biology which will be helpful for interdisciplinary research work.

**CO4.** Students will be trained in separation techniques used in molecular Biology which will be supportive in their future research

**CO5.** Industrial visits will provide the students with an opportunity to learn practically through interaction, working methods and employment practices. Students will have an exposure to Industrial standard and current work practices

#### **ELECTIVE PAPER**

### **BIOSTATISTICS & DATA SCIENCE**

#### Credits: 3

Credits: 3

**CO1:** Concepts of statistical population and sample, variables and attributes. Tabular and graphical representation of data based on variables.

**CO2:**Conditions for the consistency' and criteria for the independence of data based on attributes. Measures of central tendency, Dispersion, Skewness and Kurtosis.

CO3:Learning different sampling methods and analysing statistical significance.

**CO4:** Understanding students t test, ANOVA, Chi square test to analyse the significance of various research.

**CO5:** Learning on data science, algorithm for machine learning, artificial intelligence and big data, their applications in clinical and pharma domain .

# **BIOSAFETY, LAB SAFETY AND IPR**

# **CO1.**To understand and implement various aspects of biosafety and carry out risk assessment of products in biological research

**CO2.** Understand the basic concepts of ethics and safety that are essential for different disciplines of science and procedures involved and protection of intellectual property and related rights.

**CO3.**To appreciate the intellectual property rights and its implementation of on the invention related to biological research.

**CO4.** To understand the statutory bodies that regulate the property rights and its validity in various countries.

**CO5.**Critique the ethical concerns associated with modern biotechnology processes and plan accordingly.

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**PSO4.** Use library search tools and online databases and sources to locate and retrieve scientific information about a topic and techniques related to biochemistry.

# **SEMESTER I**

# Course: CELLBIOLOGY

#### Credits:4

**CO1.** To analyse the structures and basic components of cells.

CO2. To study the difference between prokaryotes and eukaryotes.

CO3. To understand the compartmentalization in cell biology.

CO4. To gain knowledge on the biological role of extra cellular matrix

CO5. To acquire knowledge on the importance of gap and tight junction

# Course: ALLIED CHEMISTRY-I Credits:3

CO1. To study the Basic knowledge on Metallurgy, Cycloalkanes,

CO2. To study about the Polarising Effects, Stereochemistry, Chemical Kinetics

CO3. To study about the Catalysis, Photochemistry, VSEPR Theory, Fuels,

CO4. To understand the concepts of Osmosis, Nuclear Chemistry, Petroleum Chemistry,

CO5. To study the Chemistry of Naphthalene, Conductors and Applications

#### **SEMESTER II**

#### **Course: BIOMOLECULES**

**Credits:4** 

**Credits:3** 

CO1. To understand the structures and functions of carbohydrates

**CO2.** To illustrate the classification, structure, properties of amino acids.

**CO3.** To acquire knowledge about the classification of proteins, levels of structural organization of proteins

CO4. To Gain knowledge on the structure and properties of nucleic acids.

CO5. To study the importance of various lipids

#### Course: ALLIED CHEMISTRY-II

CO1. To Understand the Basic knowledge on Coordination Chemistry, Industrial Chemistry,

CO2. To study the Carbohydrates, Amino acids, Proteins,

CO3. To acquire knowledge about the Electrochemistry, Paints and Pigments, dyes,

CO4. To study about the Vitamins, Medicinal Chemistry,

CO5. To gain knowledge on Corrosion and Applications

# **CORE PRACTICAL-1**

**CO1.** Qualitatively analyze the carbohydrates and amino acids and report the type of carbohydrate based on specific tests

**CO2**. Differentiate the carbohydrates based microscopic examination of the crystal structure.

CO3. Quantify glucose by benedict's method

CO4. Quantify ascorbic acid in lemon by Dichlorophenol indophenol dye method

CO5. Quantify glycine by Sorenson's formal titration method

CO6. Determine lipid properties of unsaturation and fatty acid content by SAP

number and iodine number

#### ALLIED :CHEMISTRY PRACTICAL

**CO1.** Volumetric analysis of Estimation of HCl by Standard sulphuric, Estimation of Borax, NaOH, FeSO4, Oxalic acid, FAS, Oxalic acid, Fe2+ using Diphenylamine / N- Phenyl Anthranilic acid as indicator.

**CO2.** Organic analysis Systematic Analysis of Organic Compounds containing One Functional Group and Characterisation by Confirmatory Tests.

# **SEMESTER III**

# ANALYTICAL BIOCHEMISTRY

**CO1.** To obtain analytical skills and practical knowledge on various techniques involved in biochemistry.

**CO2.** To determine pH & poH using electrochemical techniques.

**CO3.** To gain knowledge on the methodology involved in separation and characterization of proteins, Nucleic acid by various electrophoretic techniques.

- **CO4.** To understand the separation and purification of macromolecules using chromatography
- **CO5.** To understand atomic structure, radiation and its hazards, detection and measurement of radioactivity using GM counter and Scintillation counter

## **SKILL BASED SUBJECT PAPER - 1 FIRST AID**

**CO1.** To understand the importance of first aid

**CO2.** To gain practical knowledge on the treatment for medical emergency

**CO3.** To acquire knowledge on the treatment for various wounds.

# **SEMESTER IV**

# **PLANT BIOCHEMISTRY**

- **CO1.** To gain knowledge on the plant physiology
- **CO2.** To understand the events of photosynthesis
- **CO3.** To identify the functions of growth hormones
- **CO4.** To understand the mechanism of nitrogen fixation
- **CO5.** To illustrate the responses of plants to the stress

# Credits: 5

#### Credits: 2

Credits: 4

# **CORE PRACTICAL**

### Credits: 3

CO1: Estimate phosphorus and protein using colorimetric method

**CO2:** Exhibit the knowledge of isolation of biomolecules like starch, casein and albumin from biological samples

**CO3:** Obtain hands on training in basic separation technique like paper chromatography, thin layer chromatography to separate amino acids and sugars

**CO4:** Obtain hands on training to separate chlorophyll, carotenes of flower pigments and protein using column Chromatography

CO5: Demonstrate the principle and working of SDS PAGE and its applications

# SKILL BASED SUBJECT - BIOSTATISTICS Credits: 2

- **CO1.** To understand the definition of biostatistics and its scope.
- CO2. To Ascertain the methods and importance of data collection and presentation
- **CO3.** To Examine the usage of statistical tools like measure of central tendency and measure of dispersion
- **CO4.** To Apply hypothesis testing via t, f, z and chi square statistical distribution
- CO5. To deduce ANOVA and make statistical decision

# **SEMESTER V**

## ENZYMES AND INTERMEDIARY METABOLISM

- **CO1.** Toacquirefundamentalknowledgeonenzymesandtheirimportanceinbiological reactions.
- **CO2.** To know the mechanism of enzyme and its importance in biological reactions.
- **CO3.** To determine the biochemical reactions, central metabolic pathways and kinetics of energy and homeostasis of metabolism.
- **CO4.** To gain insights into metabolic engineering for the production of useful biomolecules.
- **CO5.** To understand the importance of high energy compounds, electron transport chain, and synthesis of ATP under aerobic and anaerobic conditions.

# MOLECULAR BIOLOGY

- **CO1.** To understand the major experimental approaches
- CO2. To gain knowledge about the steps involved in replication, transcription and translation

#### Credits: 6

- **CO3.** To study the salient features of genetic code
- CO4. To acquire knowledge of gene & to know how genes are expressed
- **CO5.** To be aware of the regulation of cellular processes, signalling and proliferation in prokaryotic cells.

# **PHYSIOLOGY AND NUTRITION**

- **CO1.** To Understand the types and functions of blood cells
- **CO2.** To learn the structure and functions of the different organs
- CO3. To understand the mechanism of digestion, absorption and respiration in the body
- **CO4.** To gain knowledge on the importance of nutrients in body
- CO5. To acquire a deep insight on the significance of vitamins and minerals in the body

# **INTERNAL ELECTIVE**

# **MOLECULAR ENDOCRINOLOGY**

CO1.	To understand the types of hormones
CO2.	To Gain knowledge on the functions of secondary messengers in the body
CO3.	To acquire deep insight on the mechanism of action of peptide hormones
CO4.	To obtain knowledge on the mechanism of action of steroid hormones
CO5.	To gain a clear understanding on Male and Female Reproductive system.

# **SKILLED BASED SUBJECT**

#### MEDICAL LABORATORY TECHNOLOGY

- **CO1.** To obtain practical skills to analyse biological samples.
- **CO2.** To perform collection and preservation of biological samples.
- **CO3.** To estimate haematological parameters
- CO4. To examine urine and stool sample for normal and abnormal constituents
- **CO5.** To acquire skills to culture microorganism.

# **SEMESTER VI**

# CLINICAL BIOCHEMISTRY

#### Credits: 5

CO1. To acquire fundamental knowledge blood glucose regulation and diabetes mellitus

#### Credits: 5

Credits: 3

- **CO2.** To know about the genetic diseases and fatty liver
- **CO3.** To obtain a knowledge of liver function tests and its interpretation with pathological diseases
- **CO4.** To gain insights renal function tests and importance of non protein nitrogenous compounds
- **CO5.** To understand the importance marker enzymes in diseases and gastric function.

#### BIOTECHNOLOGY

- CO1. To acquire knowledge on the recombinant DNA
- **CO2.** To gain insights on the various vectors
- **CO3.** To analyse the applications of rDNA in biotechnology

# **INTERNAL ELECTIVE**

#### IMMUNOLOGY

- **CO1.** To gain a wide knowledge on cells and organs of immune system
- **CO2.** To study the types of immunity
- **CO3.** To undertstand the structure and functions of antibodies
- **CO4.** To acquire skills to perform immunological techniques.
- **CO5.** To gain deep insight on the mechanisms involved during allergic reactions.

# INTERNAL ELECTIVE

#### PHARMACEUTICAL BIOCHEMISTRY

- **CO1.** To understand the chemistry of drug molecules.
- **CO2.** To Illustrate the mechanism of drug absorption, distribution and metabolism
- **CO3.** To gain knowledge on the novel drug delivery systems
- **CO4.** To appraise the uses of Plants in traditional medicine
- **CO5.** To Highlight the importance of organic phytochemicals in pharmaceuticals

## **SKILL BASED SUBJECT**

#### **RESEARCH METHODOLOGY**

- CO1. To understand the basics of researchCO2. To illustrate the importance of research paperCO3. To learn the principle of scientific research
- CO4. To understand the importance of collection and analysis of data
- **CO5.** Acquire knowledge on journals and paper writing

Credits: 5

Credits: 3

# Credits: 3

# PG DEPARTMENT OF BIOCHEMISTRY COURSE OUTCOME M.Sc., BIOCHEMISTRY 2022-2023

#### **PROGRAMME OUTCOME**

PO1. The students achieved for best computational performance in a specific context.

PO2. They cultivate the highest level of learning and technological key outcomes.

**PO3**. We were chosen social welfare-oriented skill-based subject and its applications in biology, helps to the students & social welfare.

**PO4.** We were organizing many extension activities live internship programme, industrial visit, hands on training workshop, project-oriented instrumentation programmes. It exposes the students for job opportunity and individual talents.

PO5. This competence of a course possesses upon achieved for course specific

# **PROGRAMME SPECIFIC OUTCOME**

**PSO1.** Acquire knowledge and skills to undertake a career in research in an academic setup.

**PSO2.** Apply the knowledge of experimental approaches to save problems of a chemical nature & ability to enter that knowledge to the solution.

**PSO3.** Drug development and synthesize the knowledge & apply the same for multitude of laboratory applications.

**PSO4.** Understand and apply the concepts of life Sources, empower the technical knowledge know & practical hands-on training in the field.

PSO5. Its academic, research, industrial & pharmaceutical applications.

#### **SEMESTER I**

# ADVANCES IN CELL BIOLOGY

#### Credits:4

Credits: 4

**CO1**. To study the structure and function of cells

CO2. To understand about extracellular matrix and cell communication.

CO3. To Understanding the function of intracellular organelles

CO4. Understanding the function of cell cycle mechanism

CO5. Understanding the Division of cells and Cell Death

CO6. To study the concepts of cell signalling

#### CHEMISTRY OF BIOMOLECULES

CO1. This course emphasizes on various Biomolecules and its significance.

CO2. To enable students the biological importance of lifeless chemical compounds.

CO3. To enable the students to learn the basic functions and structures of Biomolecules

**CO4.** On successful completion of the course the students should have understood the significance of the complex bio-molecules, polysaccharides, lipids and proteins.

**CO5.** To enable the students to learn the basic functions, structures and biological importance of nucleic acids and porphyrins.

CO6. To study the structure and functions of vitamins and minerals

#### Course: HUMAN PHYSIOLOGY Credits: 4

**CO1.** This course provides a comprehensive, balanced introduction to this exciting, evolving and multi-disciplinary field.

CO2. To understand the circulatory cells, blood and its components.

**CO3**. To enable the students to learn or to know the biological, physiological activities of various organs.

CO4. To understand the functions, anatomy, histology of each organ systems.

CO5. To understand to the body works and explains the mechanisms.

CO6. To understand in depth knowledge of main structure composing human body

#### ELECTIVE

# PLANT BIOCHEMISTRY

Credits: 3

**CO1.** This course presents an Introduction and provides a comprehensive, balanced introduction to this exciting, evolving and multi-disciplinary field.

CO2. To enable the students to learn or to know the aspects of photosynthesis.

**CO3.** To understand the concept of Nitrogen fixation process and interaction between assimilation and metabolism.

CO4. To understand the plant metabolism, nutrient absorption and its deficiency.

CO5. To be aware of various plant hormones and its roles.

CO6. To identify the process of Dormancy- Germination, Reproduction and budding process.

# **OPEN ELECTIVE**

# **PRINCIPLES OF INTERNET**

- CO1. To understand about what is internet
- CO2. To learn about connecting to the internet.
- CO3. To understand about world wide web.
- CO4. To learn about multimedia on the internet.
- CO5. To understand about safeguarding the internet.

#### **SEMESTER II**

## ANALYTICAL BIOCHEMISTRY

**CO1:** To Understand the working principles of analytical instruments.

CO2: To Apply and analyse the biochemical samples using analytical instruments

**CO3:** To make the student familiar with the basic concepts *of* chromatography and spectroscopy utilized for food analysis

**CO4**: To acquire some technical knowledge of, and some practical experience with, analysis in electrophoresis

**CO5:** To promote capacity building and research biodiversity use and conservation worldwide through the application of molecular markers

# **MOLECULAR BIOLOGY**

## Credits: 4

**CO1**: Understand the history and scope of molecular biology.

CO2: Acquire working knowledge of gene & to know how genes are expressed.

**CO3**: Appreciate how genetic engineering & biotechnology influence a health care in the next century.

**CO4**. Gain knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms.

CO5. Learn about DNA, RNA and their replication, mutations, DNA repair mechanism

# METABOLIC REGULATION AND DISORDERS Credits: 4

**CO1**.Understand the rate of acceleration of the biochemical reactions in the presence of the biocatalyst (enzymes).

**CO2**.Enhance the knowledge about the key biochemical pathways in metabolism and their regulations.

CO3. Analyse the importance of biochemical metabolic pathways.

**CO4**. acquire the concept of anabolism, catabolism and role of high energy compounds in the cell.

CO5. Ability to relate various interrelated physiological and metabolic events

#### **ELECTIVE II**

#### **BIOINFORMATICS**

#### Credits: 3

CO1. Understand the impact of Bioinformatics methodology in Biological Sciences.

CO2. Distinguish between the commercial and research perspectives of Bioinformatics.

CO3. Assess the interface between computational and Biological Science

#### **OPEN ELECTIVE II**

#### PRINCIPLES OF WEB DESIGN Credits:3

CO1. To combine basic HTML elements to create Web pages.

CO2. To understand the use of HTML tags and tag attributes to control a Web page's appearance.

CO3. To learn how to add absolute URLs, relative URLs, and named anchors to Web pages.

**CO4.** To gain a good understanding of using tables and frames as navigational aids on a Web site.

**CO5.** To control appearance webpages by applying style sheet.

# MAIN PRACTICAL

# PAPER-1

#### ISOLATION AND CHARACTERIZATION STUDIES Credits:3

**CO1.** Demonstrate the collection of blood sample. List the conditions essential for collection of urine and other clinical samples

CO2.Show the effect of pH, temperature and substrate concentration on the activity

of salivary amylase. Assay the activity of salivary amylase

**CO3.** Estimate creatinine by Jaffe's method, urea by DAM-TSC method, DNA by diphenylamine method and RNA by orcinol method

**CO4.** Identify and enumerate the total count of erythrocytes and leukocytes Differentiate leukocytes and calculate their total count

**CO5.** Define and determine the erythrocyte sedimentation rate, packed cell volume and mean corpuscular volume and relate their clinical implications Utilize sphygmomanometer to determine the blood pressure

#### PAPER-2

### MOLECULAR BIOLOGY AND MICROBIOLOGY PRACTICAL Credits:3

**CO1.** Demonstrate the collection of blood sample

CO2. Hands on training to sterilization and gram staining

**CO3**. Identify and enumerate the total count of erythrocytes and leukocytes Differentiate leukocytes and calculate their total count

**CO4**. Define and determine the erythrocyte sedimentation rate, packed cell volume and mean corpuscular volume and relate their clinical implications.

### **SEMESTER III**

#### MOLECULAR ENDOCRINOLOGY

#### **CO1.** To impart knowledge on molecular mechanism and Endocrine system.

- **CO2.** To provide knowledge on hormonal action and metabolic functions.
- **CO3.** To create awareness on hormonal imbalance and regulations.
- CO4. To impart basic knowledge on hormone cascade system.
- **CO5.** To develop sound knowledge on steroids and its importance

#### **ENZYME TECHNOLOGY**

#### **CREDITS:4**

- **CO1.** To impart knowledge on classification and active sites of enzymes.
- **CO2.** To provide knowledge on enzyme kinetics.
- **CO3.** To create awareness on role of inhibitors and catalytic enzymes.
- CO4. To impart basic knowledge on coenzymes and isoenzymes.
- CO5. To develop sound knowledge on Industrial and clinical enzymology

#### BIOTECHNOLOGY

#### **CREDITS:4**

- **CO1.** To provide knowledge on cloning vectors and DNA sequencing.
- **CO2.** To create awareness on gene transfer and its applications.

- **CO3.** To impart basic knowledge on Industrial biotechnology.
- **CO4.** To develop sound knowledge on Bio safety and bio hazards.
- CO5. To develop sound knowledge on Bio safety and bio hazards

## ELECTIVE

#### **A. PHYTOMEDICINE**

#### CREDITS:4

CO1. Familiar with Indian system of medicine.

- CO2 . Well versed with plant toxonamy.
- CO3. Knowledgeable on medicinal plants.
- CO4. Aware of chemistry of drugs

#### **SEMESTER IV**

#### **RESEARCH METHODOLOGY**

#### **CO1** To impart knowledge on research problem and finding scientific articles with Internet.

CO2. To provide knowledge on collection and analysis of data using statistical tools.

CO3. To create awareness on bioinformatics and biological databases.

CO4. To impart basic knowledge on animal experimentation and intellectual property rights.

CO5 .To develop sound knowledge on preparation of research reports

#### ADVANCED CLINICAL BIOCHEMISTRY

CO1. To know the abnormal constituents in urine and CSF, Aminiotic fluid collections.

CO2. To impart knowledge on the disorders of carbohydrate metabolism,

nucleic acid metabolism, lipid metabolism and amino acid metabolism.

**CO3**. To develop an understanding of organ function tests.

CO4. To develop knowledge on the concepts on diagnostic enzymology tests.

CO5. To understand the basic concepts of antioxidants and cancer

# CREDITS:4

**CREDITS:4** 

# CILDI13.4

#### **BIOINFORMATICS.**

#### **CREDITS:3**

**CO1**. To provide the strong knowledge on computer peripherals and hardware description.

**CO2.** To impart basic knowledge on operating system.

- **CO3.** To understand about basics in bioinformatics and different types of database.
- CO4. To develop sound knowledge on structural prediction of RNA and protein
- CO5. To understand about 3-D Structural analysis of bio molecules.

# NANOBIOTECHNOLOGY

#### **CREDITS:3**

- **CO1.** To provide the strong knowledge on nanobiomaterials.
- **CO2.** To impart basic knowledge on nanobiotechnology.
- CO3. To understand about nanomedicines.
- CO4. To develop sound knowledge on protein microarrays.
- CO5. To understand about nanoparticle synthesis

#### **ACDEMIC YEAR 2020–2021**

#### **B.SC., BIOCHEMISTRY**

#### **PROGRAMME SPECIFIC OUTCOME**

**PSO1:** Ability to analyse the various biological components through analytical tools in living cells and molecular machinery.

**PSO2**: Development of practical laboratory skills and strong speculative foundation in the cross over discipline of Chemistry, Microbiology & Bioinformatics.

**PSO3:** Understanding of the applications of Biochemistry in various fields such as

Clinical Biochemistry, Genetic Engineering, Molecular biology & Biotechnology.

**PSO4** : Acquire practical skills that will prepare for a future career in the interdisciplinary subjects.

#### **PROGRAMME OUTCOME**

**PO1**: After completion of Biochemistry program students will able to get exposed to strong theoretical and practical background in fundamental concepts.

PO2: To get insights of multiple important technical areas of Biochemistry.

**PO3:** To apply contextual knowledge and modern tools of biochemical research for solving problems.

**PO4:** To make them able to express ideas persuasively in written and oral form to develop their leadership qualities.

**PO5:** To demonstrate professional and ethical attitude with enormous responsibility to serve the society.

#### **SEMESTER I**

#### **CELL BIOLOGY**

#### Credits:4

**CO1:** To Explain the structures and functions of basic components of prokaryotic and Eukaryotic cells

CO2: To Describe the structure, function and composition of cell membrane and

Communicate the types and mechanism of membrane transport

CO3: To Discuss the structure and functions of cellular organelles

CO4: To Understand the types of microfilaments and mitochondria

CO5: To Describe nucleus and nucleolus; illustrate the phases of cell cycle; in

Particular mitosis and describe the significance of meiosis in genetic

Diversity Relate the structure and biological role of extra cellular matrix and cell -cell Junction with physiological processes

#### **BIOMOLECULES**

#### Credits:4

- **CO1:** To gain the knowledge about the classification, structure, properties and functions of carbohydrates.
- **CO2:** Able to understand the classification, structure, properties and importance of amino acids.
- **CO3:** To understand and gain knowledge about the classification of proteins, Levels of structural organization of proteins and its properties.
- CO4: To gain insights about the types, structure and properties of nucleic acids.
- **CO5:** To acquire knowledge about the classification, structure and properties of different types of lipids.

#### **SEMESTER II**

#### ANALYTICAL BIOCHEMISTRY

**CO1:** To A practical knowledge on the preparation of solutions separate biological sample by centrifugation Separation of subcellular organelles by differential centrifugation

**CO2:** To obtaining analytical skills to separate samples (amino acids) using paper chromatography.

**CO3:** Advanced knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy Assay of biomolecules using UV spectroscopy and spectrofluorimetry

**CO4:** To demonstrate the methodology involved in separation of proteins, Nucleic acid by various electrophoretic techniques.

**CO5:** To acquire knowledge on atomic structure. Radiation, types of radioactive decay, Detection and measurement of radioactivity using GM counter and Scintillation counter. Biological hazards of radiation and safety measures in handling radio isotopes.

### MICROBIOLOGY I

#### Credits:3

CO1: To gain knowledge on history of microbiology and various types of microscopes

CO2: To learn about cell structure and staining methods

CO3: To understand Microbial Classification and genome organization

CO4: To gain knowledge on culturing microorganisms and microbial growth

CO5: To learn about antimicrobials and various groups of microorganisms

#### FIRST AID - SKILL BASED SUBJECT

- CO1: To Summarize the importance of first aid
- CO2: To Analyse the symptoms and treatment for various medical emergencies
- CO3: To Illustrate the causes and effects of poisoning and its treatment
- CO4: To identify the causes and treatment for various aches in the body
- **CO5:** To identify the treatment for various wounds

#### **SEMESTER III**

# PLANT BIOCHEMISTRY

**CO1:** To Summarize the events in Photosynthesis

CO2: To Classify Plant Hormones And Explain Their Functions. Discuss Secondary Metabolites in Plants

CO3: To Illustrate Nitrogen Fixation by Symbiosis Biochemistry Of Nitrogen Fixation

# Credits:4

- CO4: To Distinguish between Types of Stress Tolerance in plants
- CO6: To Evaluate the Anti-Oxidant Defense in Plant

#### BIOSTATISTICS

- **CO1:** To understand the definition of biostatistics and its scope. Ascertain the methods and importance of data collection and presentation
- **CO2:** To Examine the usage of statistical tools like measure of central tendency and measure of dispersion
- **CO3:** To apply hypothesis testing via t, f, z and chi square statistical distribution& Basic definition of Probability
- CO4: To deduce the results of correlation and regression
- CO5: To deduce ANOVA and make statistical decision

#### LIFESTYLE DISEASES & PREVENTION – NME Credits: 2

- CO1: To define a Balanced Diet. Understand the importance of vitamins and minerals
- CO2: To identify Lifestyle Prone Disorders
- CO3: To Manage physiological and psychological disorders
- CO4: To Categorize Communicable and Non-Communicable Disease
- **CO5:** To Maintain good health

#### SEMESTER V

#### ENZYMES AND INTERMEDIARY METABOLISM

- **CO1:** To Acquire Fundamental knowledge in relevant principles of enzyme, mechanism of enzyme kinetics, enzyme catalysis emphasizes on capability of the students to work in a group and gather the information.
- **CO2:** To Illustrate the reactions of carbohydrate metabolism. Summarize the steps involved in ATP formation
- CO3: To identify the steps involved in oxidation o fatty acids
- CO4: To obtain knowledge on the metabolism of amino acids and formation of urea

# Credits:2

**CO5:** To summarize the steps involved in purine and pyrimidine synthesis

#### **MOLECULAR BIOLOGY**

- CO1: To infer the central dogma of molecular biology, how DNA acts as vehicle of inheritance through experimental evidences.Outline the steps involved in replication and explain the events, enzymology, fidelity and inhibitors of replication in prokaryotes
- CO2: To Summarize the process of prokaryotic transcription
- **CO3:** To define genetic code and show how it can be deciphered Relate genetic code to translation process and explain protein biosynthesis

**CO4:** To Illustrate the regulation of gene expression in prokaryotes using lac and trp operon

CO5: To Gain knowledge on gene mutation and DNA Repair mechanisms

#### PHYSIOLOGY AND NUTRITION

# Credits: 5

**CO1:** To Gain knowledge about the various types of RBC and WBC cells, different types of blood groups and basic structure and functions of heart.

**CO2:** To Illustrate the Mechanism of digestion and absorption of macromolecules.

**CO3:** To acquire the knowledge about the structure and functions of kidney, nephron and mechanism of urine formation.

**CO4:** To Realizing the fact that **"Food as medicine"**, describe the significance of carbohydrates, lipids and proteins and analyze their sources and functions in the body

**CO5:** To identify the types of vitamins and their biomedical significance of vitamins present in food. Analyze the biological importance of major and minor trace elements (Minerals) in the food

#### **MOLECULAR ENDOCRINOLOGY**

#### Credits: 3

**CO1:** To understand the structure of hormones and receptors. Classify hormones based on nature, mechanism of action.

- CO2: To explain the structure, biological action and regulation of hypothalamic and pituitary hormones.
- CO3: To Illustrate the structure, biological action and regulation of thyroid and pancreatic hormones.
- **CO4:** To understand about the actions of adrenal hormones
- **CO5:** To compare the structure and metabolic effects of adrenal hormones

#### MEDICAL LABORATORY TECHNOLOGY

- **CO1:** To follow good laboratory practices
- CO2: To examine urine and stool sample for normal and abnormal constituents
- **CO3:** To estimate Hemoglobin and other hematological parameters
- **CO4:** To Perform blood grouping
- **CO5:** To acquire knowledge on culturing microorganisms.

#### **SEMESTER VI**

#### **CLINICAL BIOCHEMISTRY**

CO1: To know the abnormal of carbohydrate metabolism

CO2: To impart knowledge on the disorders of, nucleic acid metabolism, lipid metabolism and amino acid metabolism.

**CO3:** To develop an understanding of organ function tests.

**CO4:** To develop knowledge on the concepts on diagnostic enzymology tests.

**CO5:** To understand the basic concepts of antioxidants and cancer.

### **BIOTECHNOLOGY**

**CO1:** To discuss the basic requirements and tools employed in genetic engineering process

**CO2:** To demonstrate the basic and recent techniques applied in the field of Recombinant DNA technology

#### Credits: 5

Credits: 5

- **CO3:** To apply the basic rDNA technique to produce transgenic animal, discuss gene transfer methods, their application in pharmaceutical industry, cloning and its importance
- CO4: To design plants based on rDNA techniques
- **CO5:** To describe the methods employed for DNA amplification, gene therapy and antisense RNA therapy. To discuss the basic requirements and tools employed in genetic engineering process

#### **IMMUNOLOGY**

#### Credits: 3

- CO1: To a wide knowledge on the immunity, cells and organs of immune system
- CO2: To Illustrate the structure and classification of antibodies
- CO3: To Enlight about antigen and antibody interaction during infection
- CO4: To Exposure to mechanisms involved during allergic reactions.
- **CO5:** To acquire knowledge on the principles, methodology involved in immunological techniques.

#### PHARMACEUTICAL BIOCHEMISTRY

# **CO1:** To define a drug and identify the chemistry of drug molecules. Illustrate the mechanism of drug absorption, distribution and metabolism

- **CO2:** To explain the routes of drug administration. Appraise on the novel drug delivery systems compared to the conventional routes.
- **CO3:** To Justify the use of synthetic drugs for different disease systems.
- CO4: To highlight the uses of Plants in traditional medicine
- CO5: To highlight the importance of organic phytochemicals in pharmaceuticals

### **RESEARCH METHODOLOGY**

- **CO1:** To gain wide knowledge on the fundamentals of research
- CO2: To identify the research problem and research design
- CO3: To enlighten importance of Hypothesis, Characteristics of a Good Hypothesis
- **CO4:** To exposure to write thesis
- **CO5:** To acquire knowledge on journals and paper writing. Acquire knowledge on finding scientific articles using PubMed

# Credits: 3

#### **ENZYMOLOGY ASSAY**

#### Credits: 3

- **CO1:** To demonstrate the collection of blood sample. List the conditions essential for collection of urine and other clinical samples
- **CO2:** To Show the effect of pH, temperature and substrate concentration on the activity of salivary amylase, Assay the activity of salivary amylase
- **CO3:** To estimate Creatinine by Jaffe's method, urea by DAM-TSC method, DNA by diphenylamine method and RNA by orcinol method
- **CO4:** To identify and enumerate the total count of erythrocytes and leukocytes Differentiate leukocytes and calculate their total count
- **CO5:** To define and determine the erythrocyte sedimentation rate, packed cell volume and mean corpuscular volume and relate their clinical implications Utilize sphygmomanometer to determine the blood pressure

#### HEMATOLOGY, MICROBIOLOGY AND URINALYSIS Credits: 3

- **CO1:** To Demonstrate the collection of blood sample List the conditions essential for collection of urine and other clinical samples
- CO2: To provide hands on training to sterilization and gram staining
- **CO3:** To identify and enumerate the total count of erythrocytes and leukocytes Differentiate leukocytes and calculate their total count
- **CO4:** To define and determine the erythrocyte sedimentation rate, packed cell volume and mean corpuscular volume and relate their clinical implications Utilize sphygmomanometer to determine the blood pressure
- CO5: To analyse the normal and abnormal constituents of urine sample

#### ACADEMIC YEAR 2020-2021

#### **M.Sc. BIO CHEMISTRY**

#### **PROGRAMME SPECIFIC OUTCOME**

**PSO1**: Acquire knowledge and skills to undertake a career in research in an academic

**PSO2**: Apply the knowledge of experimental approaches to save problems of a chemical nature & ability to enter that knowledge to the solution.

**PSO3**: Drug development and synthesize the knowledge & apply the same for multitude of laboratory applications.

**PSO4:** Understand and apply the concepts of life Sources, empower the technical knowledge know & practical hands-on training in the field.

PSO5: Its academic, research, industrial & pharmaceutical applications.

# **PROGRAMME OUTCOME**

**PO1:** The students achieved for best computational performance in a specific context.

**PO2:** They cultivate the highest level of learning and technological key outcomes.

**PO3:** We were chosen social welfare oriented skill based subject and its applications in biology, helps to the students & social welfare.

**PO4:** Be able to design and Contact Scientific experiments and analyzing the resulting data.

**PO5:** Able to work as a member of team.

**PO6:** Be knowledge in classical laboratory techniques and be able to use modern instrumentation.

PO7: Knowledgeable of ethical practical's in science.

**PO8:** Be able to access search and use the chemical literature.

**PO9:** We were organizing many extension activities live internship programme, industrial visit, hands on training workshop, project oriented instrumentation programmes. It exposes the students for job opportunity and individual talents.

**PO10:** These competence of a course possess upon achieved for course specific goals

#### **SEMESTERI**

#### ADVANCES IN CELL BIOLOGY

Credit-4

CO1.Tostudythe structure and function of cells
CO2.To understands about extracellular matrix and cell communication.
CO3.ToUnderstandingthefunctionofintracellularorganelles
CO4.Understandingthefunctionofcellcyclemechanism
CO5.UnderstandingtheDivisionofcellsandCell Death
CO6. To study the concepts of cell signalling.

# COURSE: CHEMISTRY OF BIOMOLECULES Credit:4

CO1. This course emphasizes on various Biomolecules and its significance.

**CO2.**To enable students the biological importance of lifeless chemical compounds.

CO3.To enables the students to learn the basic functions and structures of Biomolecules

**CO4.** On successful completion of the course the students should have understood the significance of the complex bio-molecules, polysaccharides, lipids and proteins.

**CO5**.To enable the students to learn the basic functions, structures and biological importance of nucleic acids and porphyrins.

**CO6.**To study the structure and functions of vitamins and minerals.

#### HUMAN PHYSIOLOGY

#### Credit: 3

**CO1.** This course provides a comprehensive, balanced introduction to this exciting, evolving and multi-disciplinary field.

CO2. To understand the circulatory cells, blood and its components.

**CO3.** To enable the students to learn or to know the biological, physiological activities of various organs.

CO4. To understand the functions, anatomy, histology of each organ systems.

CO5. To understand how the bodyworks and explains the mechanisms.

**CO6.** To understand in depth knowledge of main structure composing human blood

## PLANT BIOCHEMISTRY

## Credit:3

**CO1.** This course presents an Introduction and provides a comprehensive, balanced introduction to this exciting, evolving and multi-disciplinary field.

CO2. To enable the students to learn or to know the aspects of photosynthesis.

**CO3.** To understand the concept of Nitrogen fixation process and interaction between assimilation and metabolism.

CO4. To understand the plant metabolism, nutrient absorption and its deficiency.

CO5. To beaware of various plant hormones and its roles.

CO6. To identify the process of Dormancy-Germination, Reproduction and budding process.

#### SEMESTER –II

# ANALYTICAL BIOCHEMISTRY

#### **CO1.** To understand the working principles of analytical instruments.

- **CO2.** To Apply and analyze the biochemical samples using analytical instruments
- **CO3.** To make the student familiar with the basic concepts of chromatography and spectroscopy utilized for food analysis
- **CO4.** To acquire some technical knowledge of, and some practical experience with, analysis in electrophoresis
- **CO5.** To promote capacity building and research biodiversity use and conservation worldwide through the application of molecular markers

#### METABOLICREGULATIONANDDISORDERS

# **CO1.** To understand the rate of acceleration of the biochemical reactions in the presence of the biocatalyst(enzymes).

**CO2.** To enhance the knowledge about the key biochemical pathways in metabolism and their regulations.

**CO3.** To analyze the importance of biochemical metabolic pathways.

**CO4.** To acquire the concept of anabolism, catabolism and role of high energy compounds in the cell.

**CO5.**Ability to relate various interrelated physiological and metabolic events

Credit:4

#### ELECTIVE

#### **B-BIOINFORMATICS**

**CO1:**To provide the strong knowledge on computer peripherals and hardware description.

CO2: To impart basic knowledge on operating system.

**CO3:**To understand about basics in bioinformatics and different types of database.

CO4: To develop sound knowledge on structural prediction of RNA and protein

**CO5:**To understand about 3-D Structural analysis of bio molecules.

#### **SEMESTER III**

#### MOLECULAR ENDOCRINOLOGY

CO1: To impart knowledge on molecular mechanism and Endocrine system.

**CO2:** To provide knowledge on hormonal action and metabolic functions.

**CO3:** To create awareness on hormonal imbalance and regulations.

CO4: To impart basic knowledge on hormone cascade system.

CO5: To develop sound knowledge on steroids and its importance.

#### **ENZYME TECHNOLOGY**

**CO1:** To impart knowledge on classification and active sites of enzymes.

CO2: To provide knowledge on enzyme kinetics.

**CO3:** To create awareness on role of inhibitors and catalytic enzymes.

**CO4:** To impart basic knowledge on coenzymes and Isoenzyme.

**CO5:** To develop sound knowledge on Industrial and clinical enzymology.

#### BIOTECHNOLOGY

**CO1:** To impart knowledge on basic tools in genetic engineering.

CO2: To provide knowledge on cloning vectors and DNA sequencing.

CO3: To create awareness on gene transfer and its applications.

**CO4:** To impart basic knowledge on Industrial biotechnology.

CO5: To develop sound knowledge on Bio safety and bio hazards.

#### Credits: 4

Credits: 4

Credits: 4

CO6: To develop sound knowledge on Bio safety and bio hazards

## **INTERNAL ELECTIVE**

#### **A. PHYTOMEDICINE**

**CO1:** To provide the acquire knowledge on medicinal use of plants and plant extracts for therapeutic purposes.

CO2: To develop, promote and nurture research activities in phytomedicine

**CO3:** To develop and advance the knowledge to meet social needs for safe and effective herbal drugs

# **B. GENETIC ENGINEERING**

CO1: To impart knowledge on basics in genetics and intellectual property rights.

CO2: To provide knowledge on cloning vectors and DNA sequencing.

**CO3**: To create awareness on DNA enzymes and its applications.

**CO4:** To impart basic knowledge on DNA in biotechnology.

**CO5:** To develop sound knowledge on blotting techniques.

# C. DIAGNOSTIC BIOCHEMISTRY

**CO1:** To impart knowledge on basics in inborn errors.

**CO2:** To provide knowledge on enzymology.

**CO3:** To create awareness on heart disease.

**CO4:** To impart basic knowledge on anemia.

**CO5:** To develop sound knowledge on hormones.

# **OPEN ELECTIVE**

# A. MUSHROOM CULTIVATION

**CO1:** To impart knowledge on types of mushrooms.

**CO2:** To provide knowledge on cultivation process.

CO3: To create awareness on edible mushrooms.

**CO4:** To impart basic knowledge on mushroom storage.

CO5: To develop sound knowledge on mushroom nutritive values and recipes.

# **B. METHODS IN FOOD PRESERVATION**

**CO1:** To impart knowledge on basics in food processing.

# Credits: 3

Credits: 3

# Credits: 3

# Credits: 3

CO2: To provide knowledge on food preservation process.

**CO3:** To create awareness on preservation techniques.

**CO4:** To impart basic knowledge on food drying and storage.

#### C. HUMAN PHYSIOLOGY AND NUTRITION Credits: 3

CO1: To impart knowledge on basics human physiology and nutrition.

**CO2:** To provide knowledge on food digestion and absorption.

**CO3:** To create awareness on blood groups and anemia.

**CO4:** To impart basic knowledge on BMR and trace elements.

#### **SEMESTER IV**

#### **RESEARCH METHODOLOGY**

**CO1:** To impart knowledge on research problem and finding scientific articles with Internet.

CO2: To provide knowledge on collection and analysis of data using statistical tools.

**CO3:** To create awareness on bioinformatics and biological databases.

**CO4**: To impart basic knowledge on animal experimentation and intellectual property rights.

CO5: To develop sound knowledge on preparation of research reports

#### ADVANCED CLINICAL BIOCHEMISTRY

CO1: To know the abnormal constituents in urine and CSF, Amniotic fluid collections.

**CO2:** To impart knowledge on the disorders of carbohydrate metabolism, nucleic acid metabolism, lipid metabolism and amino acid metabolism.

**CO3:** To develop an understanding of organ function tests.

CO4: To develop knowledge on the concepts on diagnostic enzymology tests.

**CO5:** To understand the basic concepts of antioxidants and cancer.

#### **INTERNAL ELECTIVE**

#### **A. BIOINFORMATICS**

**CO1:** To provide the strong knowledge on computer peripherals and hardware description.

CO2: To impart basic knowledge on operating system.

# Credits: 4

#### Credits: 4

CO3: To understand about basics in bioinformatics and different types of database.

CO4: To develop sound knowledge on structural prediction of RNA and protein

**CO5:** To understand about 3-D Structural analysis of bio molecules.

# **B. NANOBIOTECHNOLOGY**

**CO1:** To provide the strong knowledge on Nano biomaterials.

**CO2:** To impart basic knowledge on Nano biotechnology.

CO3: To understand about Nano medicines.

**CO4:** To develop sound knowledge on protein microarrays.

**CO5:** To understand about nanoparticle synthesis.

# **C. STEM CELL TECHNOLOGY**

**CO1:** To provide the strong knowledge on stem cells and its types.

**CO2:** To impart basic knowledge on in vivo and in vitro differentiation of stem cells.

**CO3:** To understand about limitations of cloning.

**CO4:** To develop sound knowledge on hematopoietic stem cells.

**CO5:** To understand about skeletal muscle stem cells.

# **OPEN ELECTIVE**

# A. EVOLUTIONARY BIOLOGY

**CO1:** To provide the strong knowledge on historical review of evolutionary concept.

**CO2:** To impart basic knowledge on Current concept of homogeny.

CO3: To understand about Fossils.

**CO4:** To develop sound knowledge on plant and fungi evolution.

**CO5:** To understand about theories of human migration.

#### **B. BIOREMEDIATION**

**CO1:** To provide the strong knowledge on bioremediation and its types.

**CO2:** To impart basic knowledge on xenobiotic.

# Credits: 3

# Credits: 3

# Credits: 3

**CO3:** To understand about bioleaching and bio mining.

CO4: To develop sound knowledge on wastes management.

CO5: To understand about theories of environmental nanotechnology

# C. LIFE STYLE - DISEASE AND PREVENTION

Credits: 3

**CO1:** To provide the strong knowledge on obesity, cardiac disease and diabetes.

CO2: To impart basic knowledge on hypertension.

CO3: To understand about cancer.

**CO4:** To develop sound knowledge on age related diseases.

**CO5:** To understand about gallstone.

# **REGULATION 2017-18**

# **DEPARTMENT OF BIOCHEMISTRY**

**PSOs, COs** 

# PROGRAM SPECIFIC OUTCOME (PSO)

PSO1: Students will gain knowledge of cytology, biomolecules

PSO2: Practical skill of Microbial culture and antimicrobial chemotherapy

PSO3:Students will be able to apply analytical instruments in the field of research for Isolation, Separation and Purification of organelles and protein, DNA and RNA

PSO4:Student will be able to understand the Role of enzymes in Metabolism and as Marker for Disease and Industrial application enzymes

PSO5: Students will be able to understand the mechanism of Molecular biology and applications in Recombinant DNA technology, Fingerprinting, Human genome project, Plant and animal cell culture.

PSO6: Students will be able to understand about Etiology of Disease, Diagnosis using laboratory technology and Treatment procedure.

PSO7:Students will able to understand the concept of Immune system which protects the body from disease and Immunological disorders and production of vaccines.

PSO8: Role of computer and Statistics in data analysis in clinical epidemiology and Research.

# COURSE OUTCOMES (CO) UG COURSE OUTCOME

#### **SEMESTER-I**

#### **Course: CELL BIOLOGY**

CO1: Identify the view of cells origin and the solution of cell theory.

CO2: Compare and contrast of prokaryotic and eukaryotic cells.

CO3: Explain the sub organelles and its type of cell

CO4: Define the nature and role of organelles such as endoplasmic reticulum, ribosome, mitochondria and plasma membrane.

CO5: Outline about chromosomes, chloroplast cell communication.

# **Course: ALLIED CHEMISTRY I**

CO1: Explain the terms and process used in Metallurgy

CO2: Compare the types of effects of polarisation plays the role in organic reactions.

CO3: Determine the rate of reaction and to compare the types of catalysis.

CO4: Evaluate the types of nuclear reaction and applications of radio-isotopes.

CO5: Classify the types of hybridization and shapes of molecules.

### **SEMESTER-II**

## **Course: BIOMOLECULES**

- CO1: Classifiy of carbohydrates, isomerism of sugars, reactions of carbohydrates.
- CO2: Explain about amino acid, protein and its structure.
- CO3: Define the functions of lipids with classifications.
- CO4: Determine the nature of genetic materials purine and pyrimidine bases
- CO5: Design Watson and Crick model of DNA and types of RNA
- CO6: Outline of dietary sources, deficiency and biological functions of fat & water soluble vitamins.

# Credit-4

#### Credit-4

#### **Course: ALLIED CHEMISTRY II**

# CO1: Describe the coordination compounds and their applications.

- CO2: Evaluate the role of carbohudrate, Amino acid, proteins and vitamins.
- CO3: Determine the types of conductions in electrochemistry.
- CO4: Explain the application of points, chromatographic techniques.
- CO5: Evaluate the types of drugs applied for diseases.

#### **Course: Chemistry I & II (Allied Practical)**

- CO1: Analyze and identify the functional groups present in the given substance.
- CO2: Understand types f reaction
- CO3: Determine the strength of the solutions.

#### Course: LANGUAGE SKILLS AND COMMUNICATION-I (NME) Credit-2

CO1: Understand the importance of Language and communication

CO2: Able to understand and apply the knowledge of human communication and language

CO3: Acquire skills like interpersonal, intra personal and intra cultural communication.

#### **Course: Core Practical - Practical I**

- CO1: Analyze qualitative tests of carbohydrates
- CO2: Describe about reducing sugar, osazone formation with conformation test
- CO3: Analyze qualitative test of amino acids
- CO4: Determine quantitative test of sugar, amino acids & ascorbic acids

#### Course: Allied Practical - Chemistry Practical I & II Credits 2

- CO1: Understand the lab safety & handling the apparatus
- CO2: Compare the properties of organic substances
- CO3: Evaluate the normality of the solutions

#### **Course: Core Practical - Practical II**

CO1: Understand the concept of isolation process of lipids, cholesterols from egg CO2: Isolate starch from potato

Credits 4

# Credits -4

#### Credit: 2

- CO3: Demonstrate colorimetry& chromatographic techniques
- CO4: Estimate the quantity of amino acid, protein by colorimetrically
- CO5: Preparation of buffer

#### Course: Allied Practical - Microbiology I & II

- CO1: Understand the sterilization techniques
- CO2: Evaluate the soil microorganisms
- CO3: Explain staining Techniques
- CO4: Explain serial dilution techniques
- CO5: Analyze puncture techniques

## **Course: Core Practical - Practical III**

- CO1: Analyze creatinine, urea, glucose by colorimetrically
- CO2: Analyze biological samples of salivary amylase
- CO3: Estimate enzyme activity of urease
- CO4: Analyze serum samples (SGOT, SGPT)
- CO5: Demonstration of electrophoretic techniques
- CO6: Understand the concept of sample separation by electrophoretic techniques

#### Course : Elective Practical - Practical IV Medical Lab Technology Credits 3

- CO1: Acquire phlebotomy skills
- CO2: Evaluate the haematology parameters
- CO3: Identify the normal & abnormal constituents of urine
- CO4: Understand microbiological concept of staining, streaking & culturing.

# **SEMESTER-III**

# Course: Fundamentals of Computer I (SBS) Credit: 3

CO1: Acquire basic word processing skills with Microsoft Word, such as text input and formatting, editing, cut, copy and paste, spell check, margin and tab controls, keyboard shortcuts, printing, as well as how to include some graphics such as pictures and charts.

CO2: Evaluate information on the Web (learn how to be critical and evaluate what is valid and reliable).

Credits 5

CO3: Explain the basics of e-mail, such as sending, forwarding and receiving mail, attaching documents, creating mailboxes, filters, and address books.

CO4: To be able to describe why computer systems are important needed to be reliable.

CO5: Explain Fundamental concepts related to computer system.

# Course: Biophysical and Biochemical Techniques I Credit: 3

CO1: Students will demonstrate a core knowledge base in the theory and practice of modern Biochemistry and biophysical (BB)

CO2: Understand Units of solute measurement in solution.

CO3: Explain about the Concept and application of pH in the buffer.

CO4: Illustrated the Instrumentation and application of electrode

CO5: Understand the partition and abstraction Chromatography Technique.

CO6: Acquire knowledge on Preparative and differential certification technique.

# **Course: Microbiology (ALLIED)**

# Credits: 4

CO1: Understand the microscopic techniques

CO2: Classify the structure and functions of cell organelles

- CO3: Understand animal cell culture techniques
- CO4: Acquire skills on the classical techniques of microbial identification
- CO5: Analyze microbial growth determination

# Course: LANGUAGE SKILLS AND COMMUNICATION-II (NME) Credit-2

- CO1: Acquire skills on technology mediated communication
- CO2: Able to improve the fluency of speaking
- CO3: Analyze the correct usage of grammar in writing and speaking.

#### **SEMESTER-IV**

#### Course: BIOPHYSICAL TECHNIQUES –I

CO1: Create a practical knowledge on the separation of biological sample by centrifugation

CO2: Create analytical skills to separate samples by chromatography.

CO3: Acquire knowledge of spectroscopy.

CO4: Explain about the radiation and types of radio decay.

## **Course: MICROBIOLOGY**

CO1: Understand the Microbial waste treatment methods.

CO2: Explain about the food prevention techniques.

CO3: Illustrate the distribution and source of airborne microorganisms.

CO4: Design the industrial production of penicillin.

CO5: Theorize the cloning techniques and gene therapy methods.

#### **Course: COMPUTER APPLICATION**

CO1: Understand operating system, MS DOS and Windows XP opening and closing.

CO2: Construct electronic mailing and web page.

CO3: Solve computer virus and components failure then downloading files.

CO4: Defend computer applications in educational institutions.

#### **SEMESTER-V**

#### Course: ENZYMES AND INTERMETIARY METABOLISM Credit-6

CO1: Classify and nomenclature specificity of enzymes.

CO2: Analyze the factors affecting enzymes activity –pH, temperature, enzyme concentration.

- CO3: Formulate metabolic pathways of carbohydrate metabolism.
- CO4: Evaluate high energy components of metabolites.
- CO5: Explain about the oxidation of fatty acids-  $\beta$  oxidation,  $\alpha$  oxidation and  $\omega$  oxidation.

#### Credit-3

# Credit-4

CO6: Define the degradation of proteins.

CO7: Explain about the biosynthesis and degradation of purine and pyrimidine metabolism.

# Course: HUMAN PHYSIOLOGY AND NUTRITIONAL BIOCHEMISTRY Credit-4

- CO1: Explain the components of transport of O<sub>2</sub> and CO<sub>2</sub> role of Hb mechanism of respiration.
- CO2: Define digestive system, digestion and absorption of nutrients.
- CO3: Outline of excretory system and function of urine.
- CO4: Design Endocrine glands and their function of nervous system and neurotransmission.
- CO5: Analyze basic food groups' role and nutritional significance and malnutrition.

#### Course: MEDICAL LAB TECHNOLOGY

#### Credit- 3

- CO1: Understand about the code of conduct for lab personnel.
- CO2: Design and handle the basic instruments for laboratory usages.
- CO3: Collect and analyze biological samples like urine, blood, fecal sample and its analysis.
- CO4: Explain about the CSF, other body fluids and parasites.

#### Course: GENETICS and MOLECULAR BIOLOGY Credit-4

- CO1: Understand the concept of hereditary in plant and human being.
- CO2: Describe the mechanism of DNA, RNA and Protein synthesis.
- CO3: Identify the role of Inhibitors in treatment of cancer.
- CO4: Compare and contrast role of mutation in genetic disorder and cancer development.
- CO5: Explain the role of mutation in genetic disorders and biodiversity.

#### **SEMESTER VI**

#### **Course: IMMUNOLOGY**

CO1: Compare and contrast innate and adaptive immunity

CO2: Design a model of immunoglobulin and its role

CO3: Explain cell types and organ present in the immune response

CO4: Identify various mechanisms that regulate immune response and its tolerance.

#### **Course: CLINICAL BIOCHEMISTRY**

CO1: Define the fundamental biochemistry knowledge related to health& diseases

CO2: Explain diseases related to carbohydrate, amino acid & lipid metabolism

CO3: Evaluate the clinical importance of inborn errors of metabolism

CO4: Determine the clinical laboratory procedure and quality control, sign and symptoms, diagnosis & treatment

CO5: Define clearance test, and explain the clinical interpretation of function tests

CO6: Outline the functional and non functional plasma enzymes

CO7: Diagnose of clinical disorder by estimation of biomarkers

#### **Course: BIOTECHNOLOGY**

- CO1: Understand the different vectors plasmid, cosmid and phages with its role.
- CO2: Understand the types of yeast, plant, animal vector and artificial chromosome.
- CO3: Identify selection and screening of recombinant vectors.

CO4: Understand the mechanism and types of animal and plant tissue culture.

CO5: To develop therapeutic vaccines, hormone clotting factors, stem cell and animal cloning.

#### **Course Name: BIOSTATISTICS**

- CO1: Understand the collection, classification and tabulation of statistical data.
- CO2: Execute measure of central tendency, mean, median and mode.

CO3: Analyze standard deviation, variance and coefficient of variation.

CO4: Define kinds of probabilities, permutation and combination.

CO5: Compare correlation analysis, partial and total correlation.

#### **Credit-4**

Credit-3

Credit-6

#### **PG COURSE OUTCOME**

#### **SEMESTER I**

#### **Course: CELL DYNAMICS AND ENVIRONMENT BIOLOGY** Credit-4

CO1: Understand the regulation of cell growth in prokaryotes and eukaryotes.

CO2: Define the morphology of cell organelles and its function.

CO3: Distinguish and differentiate the biotic and abiotic environment

CO4: Describe the synthesis of organic polymers

CO5: Understand the concept of evolution, molecular divergence and molecular clock.

#### **Course: CHEMISTRY OF MACROMOLECULES** Credit-5

CO1: Describe the structure and function of homo and hetroglycans

CO2: Understand the structural elucidation of amino acids and proteins

CO3: Distinguish the Nucleic acids

CO4: Describe the lipids classification, structure and functions

CO5: Understand the vitamins deficiency diseases

#### **Course: HUMAN PHYSIOLOGY**

CO1: Describe the composition of digestive system

CO2: Understand the cardiac cycle

CO3: Explain the mechanism of resprition and reproduction

CO4: Explain endocrine & nervous system

CO5: Understand the nutritional value & dietary system

#### Course: PLANT BIOCHEMISTRY AND PLANT MOLECULAR BIOLOGY Credit-3

CO1: Understand the concept of light and dark reaction of photosynthesis in C3 and CAM Plants.

CO2: Understand the Nitrogen fixation in leguminous and non-leguminous plants.

CO3: Distinguish and differentiate the role of plant hormones.

CO4: Understand the DNA polymorphism using RFLP and RAPD in Plant breeding.

#### **SEMESTER II**

#### **Course: ANALYTICAL BIOCHEMISTRY**

CO1: Describe the instrumentation & its application of electrodes

CO2: Acquire the concept of chromatographic techniques

CO3: Explain the separation of biological samples by centrifugation techniques

CO4: Describe the instrumentation & applications of Electrophoretic techniques

CO5: Distinguish the principles & methodology molecular techniques

# **Course: ADVANCED ENZYMOLOGY**

CO1: Explain classification, isolation and purification of enzymes

CO2: Analyze the enzyme kinetics

CO3: Understand the mechanism of enzymication and inhibition

- CO4: Distinguish the role co enzymes and isoenzymes
- CO5: Understand the uses of enzymes in industrial and clinical

#### **Course: INTERMEDIARY METABOLISM**

- CO1: Understand the carbohydrate metabolic pathway
- CO2: Describe the lipid metabolism
- CO3: Explain protein metabolism
- CO4: Understand nucleic acid metabolism
- CO5: Understand prophyrin photosynthesis and metabolic activity

#### **Course: MICROBIOLOGY (Elective)**

- CO1: Understand the morphology of ultrastructure of microbes
- CO2: Understand the Calvin cycle
- CO3: Explain the methods microbial media
- CO4: Understand the principle of microbial techniques

#### **Course: Pratical -I – Isolation and purification**

- CO1: Analyzing the isolation of Glycogen, DNA, RNA
- CO2: Estimate the quantitatively Pyruvate, Tryptophan, Ascorbic acid
- CO3: Understand the chromatographic techniques

# Credit-4

# Credit-4

# Credit-3

**Credits-5** 

- CO4: Understand the separation of Protein and Glutathione
- CO5: Estimate the amount of iron, Sodium

#### Course: Pratical -II – Enzymology and purification and kinetic studies Credits-5

- CO1: Estimate the amount of isolation of acid phosphates
- CO2: Understand the assay of clinical important of enzymes
- CO3: Understand the handling and maintance of microbial techniques
- CO4: Analyze the assay of serum enzymes
- CO5: Understand the various media preparation
- CO6: able to know the techniques PCR PAGE TLC

#### SEMESTER III

#### **Course: ADVANCED ENDOCRINOLOGY**

Credit-5

- CO1: Discuss the classification of hormones based on receptors
- CO2: Illustrate the synthesis of amino acid derived hormones
- CO3: Understand cyclic hormonal cascade system and protein kinases
- CO4: Execute the role hormone receptors and its regulation
- CO5: Categorize the steroid hormones
- CO6: Describe the hormonal disorders

#### **Course: RESEARCH METHODOLOGY**

- CO1: Discuss the essential features of scientific writing.
- CO2: Illustrate the figures, tables and reference style.
- CO3: Calculate the test of significance based on large samples.
- CO4: Execute the role of computers in biology to find the research articles using science direct/PubMed.
- CO5: Categorize the database management systems and searching sequence database using FASTA, BLAST/CLUSTAL.
- CO6: Recognize CPCSEA guidelines and ethics in drug safety.

#### **Course: BIOTECHNOLOGY**

CO1: Understand the different vectors plasmid, cosmid and phages with its role.

CO2: Understand the types of yeast, plant, animal vector and artificial chromosome.

CO3: Seek insertion of foreign DNA using restriction enzyme.

- CO4: Identify selection and screening of recombinant vectors.
- CO5: Understand the mechanism and types of animal tissue culture.
- CO5: Understand the genetically modified organisms

## **Course: BIOINFORMATICS**

- CO1: Understand the data concept of bioinformatics.
- CO2: Able to know types of alignment of nucleic acid and protein.
- CO3: Analyze the sequences using bioinformatic tools (BLAST, FASTA)
- CO4: Evaluate and predict phylogenetic tree, protein structure and drug designing.

#### **SEMESTER IV**

#### **Course: MOLECULAR BIOLOGY**

- CO1: Understand the type of DNA replication
- CO2: Able to know types of RNA and its transcription
- CO3: Analyze the genetic codon and its features
- CO4: Describe the protein biosynthesis
- CO5: Analyze the protein transport and gene expression
- CO6: Evaluate type of mutation and repair mechanism

#### Course: ADVANCED CLINICAL BIOCHEMISTRY

- CO1: Understand the normal values of clinical parameters
- CO2: Able to know the method of CSF collection
- CO3: Analyze the disorder of carbohydrate metabolism
- CO4: Describe the lipid metabolism
- CO5: Analyze the protein and clinical enzymology
- CO6: Evaluate renal and hepatic function test

#### Credit-5

Credit-5

# Credit-3

#### **Course: HERBAL TECHNOLOGY**

#### Credit-5

CO1: Understand the Indian system of medicine.

CO2: Distinguish and differentiate the medicinal plant classification.

CO3: Analyze the morphological and histological studies of plant drug.

CO4: Evaluate the medicinal uses and biomedical importance of plants.

CO5: Able to know plant drug used in cardiac disease, cerebral disease and Nasal diseases.

CO6: Able to know conservation of medicinal plants and pharmacological analysis of plant drug.

# Course: Core Practical - Practical III Biochemical Analysis of blood, Immunological and molecular biology techniques Credit: 5

- CO1: Analyze creatinine, urea, glucose by semiautoanalyzer
- CO2: Analyze biological samples of serum cholesterol, triglycerides
- CO3: Estimate bilirubin and hemoglobin
- CO4: Analyze blood grouping and Rh typing
- CO5: Demonstration of ELISA
- CO6: Understand the concept of immunodiffusion

# **Course: Elective Practical - Practical IV Haematological Methods and Urinary analysis**

- CO1: Acquire clotting bleeding time
- CO2: Evaluate the ESR and PTT
- CO3: Identify the RBC and WBC count
- CO4: Understand urinary analysis
- CO5: Demonstration of urinary culture analysis