

## B.Sc. I YEAR

### SEMESTER-I

| Code         | Course Title                     | Course Type   | HPW               | Credits      |
|--------------|----------------------------------|---------------|-------------------|--------------|
| <b>BS104</b> | <b>Chemistry Of Biomolecules</b> | <b>DSC-1A</b> | <b>4T +2P = 6</b> | <b>4+1=5</b> |

### COURSE OUTCOMES

**After studying this paper, biochemistry graduate students will be able to:**

- ✓ Understand biochemistry at the atomic level, draw molecules and reactions involved with biomolecules.
- ✓ know the various weak acids and bases, biological buffers present in our body
- ✓ Learn the molecular structures of 20 amino acids, differentiating essential and non-essential amino acids, biologically important modified amino acids and their functions.
- ✓ Recognize the structural levels of organization of proteins, 3D structure of proteins, its functions, denaturation (hemoglobin, myoglobin etc.).
- ✓ Understand the difference between monosaccharides, disaccharides and polysaccharides. storage and structural polysaccharides.
- ✓ Have a clear picture of biomembranes, behavior of amphiphatic lipids in water, formation of micelles, bilayers, vesicles, membrane composition and fluid mosaic model
- ✓ Recognize lipid and porphyrin structures, lipoproteins and functions of prostaglandins.
- ✓ Describe how lipids, cholesterol, prostaglandins etc. are synthesized, emphasizing the genetic defects of lipid metabolism.
- ✓ Understand the relationship between the properties of macromolecules and cellular activities, cell metabolism and chemical composition.
- ✓ Learn the molecular structures of 20 amino acids acid base properties, differentiating essential and non-essential amino acids, biologically important modified amino acids and their functions.

## SEMESTER-II

| Code  | Course Title  | Course Type | HPW        | Credits |
|-------|---|-------------|------------|---------|
| BS204 | Chemistry Of Nucleic Acids & Biochemical Techniques | DSC-1B      | 4T +2P = 6 | 4+1=5   |

## COURSE OUTCOMES

**After studying this paper, biochemistry graduate students will be able to:**

- ✓ Understand biochemistry at the atomic level, draw molecules and reactions involved with biomolecules.
- ✓ To know the various structures of DNA ,RNA ,nucleosides and nucleotides.
- ✓ Learn the molecular structures of DNA double helix ,denaturation , biologically importance of RNA, types of RNA and their functions.
- ✓ Recognize the reassociation kinetics,cot curves and their significance.find the Tm values ,hyperchromic effect.
- ✓ Understand the difference between colorimetry and spectroscopy,Beer Lamberts law and its limitations.
- ✓ To study the principles involved in flourimetry and centrifugation.
- ✓ To have a clear picture of principles and instrumentation in TLC,paper chromatography,gel filtration,ion-exchange and affinity chromatography.
- ✓ Describe/recognize photochemical and spectral characteristics of nucleic acids.
- ✓ Understand the relationship between laws of absorption and molar extinction coefficient.

## **B.Sc. II YEAR**

### **SEMESTER-III**

| <b>Code</b>   | <b>Course Title</b>   | <b>Course Type</b> | <b>HPW</b>        | <b>Credits</b> |
|---------------|---|--------------------|-------------------|----------------|
| <b>BS 304</b> | <b>Bioenergetics,<br/>Biological<br/>oxidation and<br/>Enzymology</b> | <b>DSC- 1C</b>     | <b>4T +2P = 6</b> | <b>4+1=5</b>   |

### **COURSE OUTCOMES**

**After studying this paper, Biochemistry Graduate students will be able to:**

- ✓ Describe structure, functions and the mechanism of action of enzymes. Learning kinetics of enzyme catalysed reactions and enzyme inhibitions and regulatory process. Ability to perform immobilization of enzymes. Exposure of wide applications of enzymes and future potential.
- ✓ Understand the fundamental energetics of biochemical processes, chemical logic of metabolic pathways. Knowing in detail about concepts to illustrate how enzymes and redox carriers and the oxidative phosphorylation machinery occur.
- ✓ Understand the utilization of proton gradient to drive the formation of high energy bonds and high energy compounds.
- ✓ To provide a deeper insight in to the fundamentals of enzyme structure and function and kinetics of soluble and immobilized enzymes. Discussion on current applications and future potential of enzymes.
- ✓ Complete understand of rate of reactions and order of reactions, and inhibitions and their kinetics. To gain knowledge on enzyme catalysis and isoenzymes and and on multienzyme complexes.
- ✓ Understanding the concepts of standard redox potential and the enzymes in biological oxidations. A brief account of Mitochondria and chloroplast structure, ATPase (oxidative phosphorylation) and C3 and C4 cycles in plants.

| <b>Code</b>   | <b>Course Title</b>               | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|---------------|-----------------------------------|--------------------|------------|----------------|
| <b>BS 301</b> | <b>Computational Biochemistry</b> | <b>SEC -1</b>      | <b>2</b>   | <b>2</b>       |

### **COURSE OUTCOMES**

**By the end of this course the student will able to learn:**

- To have basic knowledge of Modern Biology and Genomics.
- Introduction to tools of Bioinformatics
- To understand the advantages and disadvantages of different machine learning techniques in bioinformatics.
- To understand how theoretical approaches can be used to model and analyze complex biological systems.
- The student can explain which type of data can be available from the most common protein sequence and structure databases like UNIPROT and CATH, Genbank.
- The student can explain principles of computational methods for the prediction of secondary structures, elements from protein sequence, homology modeling

## **SEMESTER-IV**

| <b>Code</b>   | <b>Course Title</b>            | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|---------------|--------------------------------|--------------------|------------|----------------|
| <b>BS 404</b> | <b>Intermediary Metabolism</b> | <b>DSC-1D</b>      | <b>4</b>   | <b>4</b>       |

## **COURSE OUTCOMES**

**By the end of the course the students will able to learn:**

- The student will be able to explain the general design of metabolic pathways based on Bio Energetic principles.
- Describe how carbohydrates (glucose & glycogen), lipids (fatty acids , TAG), nucleic acids are synthesized, degraded and regulated and the role of enzymes
- Have a holistic view on metabolism & recognize how different pathways are functionally interlinked & how they are regulated by intracellular and extracellular signals.
- Recognize How metabolism can be related to issues in lifestyle, health, disease.
- To study the Inborn errors of metabolism ( Gout, Maple syrup disease)

| <b>Code</b>   | <b>Course Title</b>           | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|---------------|-------------------------------|--------------------|------------|----------------|
| <b>BS 401</b> | <b>Medical Lab Technology</b> | <b>SEC-2</b>       | <b>2</b>   | <b>2</b>       |

### **COURSE OUTCOMES**

**By the end of the course the students will able to learn:**

- To compare and contrast clinical laboratory procedures, interpret data & predict the pathogen isolated.
- To distinguish normal and abnormal microscopic characteristics of blood cells through performance of complete blood count.
- Compare different antibiotic susceptibility test methods, interpret results of antimicrobial susceptibility tests.
- Demonstrate technical skills by following established procedures & Processing biological specimen analysis.
- To study the Importance of Biomarkers and to Correlate laboratory detection of tumour markers with cancers and metastatic disease.

## **SEMESTER-V**

| <b>Code</b>    | <b>Course Title</b>      | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|----------------|--------------------------|--------------------|------------|----------------|
| <b>BS 506A</b> | <b>Molecular Biology</b> | <b>DSE-1E</b>      | <b>3</b>   | <b>3</b>       |

## **COURSE OUTCOMES**

**By the end of the course the students will able to learn:**

- To understand the basic concepts like gene , Genome , Chromosome and their structures and organization in both prokaryotes and eukaryotes
- To study and understand why nucleic acid is called Genetic material.
- To know different steps in the central dogma of molecular biology, enzymes involved in synthesis of DNA, RNA and protein.
- Learn the basic steps involved in DNA replication in prokaryotes emphasizing the enzymes involved in different types of replication.
- To learn the events in the synthesis of RNA in both prokaryotes and eukaryotes, their regulation, and post transcriptional modifications.
- To study about the genetic code, and its nature
- To learn the mechanism involved in the protein synthesis and the modification seen on the protein after its synthesis.
- To understand the concept of operon and understand their functioning with lac and trp operons.

| <b>Code</b>   | <b>Course Title</b>                         | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|---------------|---|--------------------|------------|----------------|
| <b>BS 503</b> | <b>Physiology and clinical Biochemistry</b> | <b>DSC-1E</b>      | <b>3</b>   | <b>3</b>       |

### **COURSE OUTCOMES**

**By the end of the course the students will able to learn:**

After studying this paper, biochemistry graduate students will be able to:

- ✓ Understand biochemistry and patho physiology associated with performed in Clinical biochemistry laboratory.
- ✓ Have a good knowledge on Nervous & Muscular systems helps in add on courses such Acupuncture, Physiotherapy.
- ✓ Understand the nutritional requirements and the role of food and nutrients in health and disease processes and describing the methods used to carry out nutritional methods.
- ✓ Understand the clinical history perform physical examination, suggest investigations, interpret the results and documentary findings.
- ✓ To understand how living systems function from molecular and cellular to be systems level emphasizing an integrative approach to study the biological approach of the human body.
- ✓ To understand the relationship between food and a healthy body more specifically emphasizing on how nutrients are digested, absorbed, transported and metabolized, stored and eliminated by the body.

## **SEMESTER-VI**

| <b>Code</b>             | <b>Course Title</b>                 | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|-------------------------|-------------------------------------|--------------------|------------|----------------|
| <b>BS 603<br/>P-VII</b> | <b>Nutrition and<br/>Immunology</b> | <b>Semester</b>    | <b>3</b>   | <b>3</b>       |

## **COURSE OUTCOMES**

**After studying this paper, biochemistry graduate students will be able to:**

- ✓ Understand the nutritional requirements and the role of food and nutrients in health and disease processes and describing the methods used to carry out nutritional methods.
- ✓ To understand the relationship between food and a healthy body more specifically emphasizing on how nutrients are digested, absorbed, transported and metabolized, stored and eliminated by the body.
- ✓ To learn about various fat soluble and water soluble vitamins its source, structure, biochemical roles and its deficiency disorders.
- ✓ Learn about the organization, structural features and functions of the immune system.
- ✓ To describe the components of the immune system and how cells and organs play an important role in the immune responses.
- ✓ Explain the specific interactions of antigens and antibodies in blood grouping.
- ✓ Critically understand the abnormal manifestations of the immune response in the form of Hypersensitive reactions and autoimmune diseases.
- ✓ Study the principle and applications of various immuno techniques ranging from precipitation and agglutination reactions to ELISA, Radio immunoassay.
- ✓ To study about the role of Vaccines and types or mode of their action.
- ✓ To know the fundamentals of graft rejection and MHC proteins.

## **SEMESTER-VI**

| <b>Code</b>                | <b>Course Title</b>                              | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|----------------------------|--|--------------------|------------|----------------|
| <b>BS 606 A<br/>P-VIII</b> | <b>Microbiology<br/>and r-DNA<br/>technology</b> | <b>Semester</b>    | <b>3</b>   | <b>3</b>       |

## **COURSE OUTCOMES**

**After studying this paper, biochemistry graduate students will be able to:**

- ✓ To know the brief history of microbiology and classification of microorganisms.
- ✓ To isolate bacteria and learn to prepare media for the microbial growth.
- ✓ Understand the morphological differences of different microorganisms, identifying industrially and economically useful microorganisms and applying them in different fields.
- ✓ Learn gene cloning for the expression of desired gene, amplifying the DNA, which is applied in various genomic level researches.
- ✓ To learn DNA sequencing methods such as Maxam Gilbert and Sanger's methods.
- ✓ Gain knowledge about Recombinant DNA technology by studying about various Vectors and Restriction Enzymes involved.
- ✓ Study of Various Expression Systems and Molecular Markers.
- ✓ Application of R-DNA technology and use of Restriction enzymes in construction of various vectors and libraries such as c-DNA libraries.
- ✓ Screening of the libraries with the help of "Reporter Genes" and Molecular Markers such as RFLP, RAPD, AFLP.
- ✓ To know the various applications and production of gene cloning such as Insulin, hGH, Bt cotton.
- ✓ Outlines of blotting techniques such as southern, northern and western.

### **III YEAR (ANNUAL PATTERN)**

| <b>Code</b>  | <b>Course Title</b>   | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|--------------|---|--------------------|------------|----------------|
| <b>P-III</b> | <b>Physiology,<br/>Immunology<br/>and clinical<br/>biochemistry</b> | <b>Yearwise</b>    | <b>3</b>   |                |

### **COURSE OUTCOMES**

After studying this paper, biochemistry graduate students will be able to:

- ✓ Understand biochemistry and patho physiology associated with performed in Clinical biochemistry laboratory.
- ✓ Have a good knowledge on Nervous & Muscular systems helps in add on courses such Acupuncture, Physiotherapy.
- ✓ Understand the nutritional requirements and the role of food and nutrients in health and disease processes and describing the methods used to carry out nutritional methods.
- ✓ Understand the clinical history perform physical examination, suggest investigations, interpret the results and documentary findings.
- ✓ learn about the structural features, functions of the components of immune system, emphasizing the mechanisms involved in immune system.
- ✓ To understand how living systems function from molecular and cellular to be systems level emphasizing an integrative approach to study the biological approach of the human body.
- ✓ To understand the relationship between food and a healthy body more specifically emphasizing on how nutrients are digested, absorbed, transported and metabolized, stored and eliminated by the body.

| <b>Code</b> | <b>Course Title</b>              | <b>Course Type</b> | <b>HPW</b> | <b>Credits</b> |
|-------------|----------------------------------|--------------------|------------|----------------|
| P-IV        | Microbiology & Molecular Biology | Yearwise           | 3          |                |

### **COURSE OUTCOMES**

After studying this paper, biochemistry postgraduate students will be able to:

- ✓ Understand the morphological differences of different microorganisms, identifying industrially and economically useful microorganisms and applying them in different fields.
- ✓ Understand different steps in the central dogma of molecular biology, enzymes involved in synthesis of DNA, RNA and protein.
- ✓ Present hypothesis and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypothesis.
- ✓ Exhibit a knowledge base in genetics, cell and molecular biology.
- ✓ Learn gene cloning for the expression of desired gene, amplifying the DNA, which is applied in various genomic level researches.
- ✓ Learn fundamental genetic, biotechnology principles and practices and apply that to analyze and manipulate traits in living organisms.
- ✓ Describe the contents and properties of the most important bioinformatics databases, perform text-and searches, and analyze and discuss the results in light of molecular biological knowledge.
- ✓ Understand the intersection of life and information sciences, using different software's like genomics, proteomics, BLAST, FASTA etc to extract information from large database and applying them at genome level.