SEMESTER-III
COURSE1: CELL BIOLOGY & BIOLOGICAL CHEMISTRY

Theory **Credits: 3** **3 hrs/week**

Course Objectives
1. To explain that the cell is the basic unit of life in all organisms.
2. To study the structure and functions of prokaryotic and eukaryotic cells.
3. To describe cell organelles, cell cycle, and cell division.
4. To understand the structure and importance of nucleic acids, proteins, carbohydrates, and lipids.
5. To learn about enzymes, energy metabolism, and how cells use energy.

Learning Outcomes
After completing this course, students will be able to:
1. Describe the structure and role of different types of cells.
2. Explain how organelles work and how cells divide.
3. Identify the structure and function of nucleic acids, proteins, carbohydrates, and lipids.
4. Understand how enzymes work and how energy is produced in cells.
5. Relate cell structure and biochemistry to the overall working of living organisms.

Syllabus

UNIT I – Cell as the Basic Unit of Life
Cell as a basic unit of living organisms. Cell theory, Ultra-structure of prokaryotic cell. Brief description of viral, , fungal, plant and animal cells. Cell wall (comparison of plant cell, bacterial, fungal cell) and plasma membrane (different Models). Differences between eukaryotic cell and prokaryotic cell

UNIT II – Sub-cellular Organization & Cell Division
Sub-cellular organelles: Nucleus, cytosol, endoplasmic reticulum, chloroplast, mitochondria, vacuoles, ribosomes, peroxisomes, lysosomes, Golgi complex. Cell Division: Mitosis and Meiosis. Cell Cycle – phases and regulation.

UNIT III – Nucleic Acids & Proteins
Nucleic acids: Chemical structure and base composition; Chargaff's rule. Watson-Crick Model (B-DNA), deviations, and alternate forms of DNA (A- DNA and Z-DNA). Organization of chromosome in eukaryotes. Amino acids: Structure, classification (pH-based, polarity-based, nutrition-based). Proteins: Levels of organization – primary, secondary, tertiary, and quaternary structures.

UNIT IV – Carbohydrates & Lipids
Carbohydrates: Definition, classification, nomenclature. Structures of monosaccharides, disaccharides, and polysaccharides. Concept and examples of heteropolysaccharides. Lipids: Structure of saturated and unsaturated fatty acids, triglycerides, phospholipids. Chemistry of porphyrins – heme and chlorophyll.

UNIT V – Enzymes & Bioenergetics
Enzymes: Classification and nomenclature. Factors affecting enzyme activity – substrate concentration, enzyme concentration, pH, and temperature. Enzyme inhibition – reversible inhibition (competitive, uncompetitive, non-competitive). Bioenergetics: Concepts of free energy,

entropy, enthalpy, and redox potential. High-energy bonds – structure and role of ATP. Energy metabolism – glycolysis and Kreb's cycle.

Reference Books:

1. Bruce Alberts et al. –Molecular Biology of the Cell

2. Lodish, Berk, Kaiser, Krieger et al. –Molecular Cell Biology

3. Verma & Agarwal –Cell Biology, Genetics, Molecular Biology, Evolution and Ecology

4. Lehninger Principles of Biochemistry

5. Biochemistry –Donald Voet & Judith Voet

6. Satyanarayana & Chakrapani –Biochemistry

SEMESTER-III
COURSE1: CELL BIOLOGY & BIOLOGICAL CHEMISTRY
Practical **Credits: 1** **2 hrs/week**

Practical Component:
1. Principle and utilization of microscope
2. Preparation of blood smear and observation of cells
3. Study of divisional stages in mitosis
4. Study of divisional stages in meiosis
5. Observation of permanent slides of bacterial, fungal, plant and animal cells
6. Calculation of molarity, normality, and molecular weight of compounds.
7. Qualitative analysis of carbohydrates (sugars)
8. Quantitative analysis of carbohydrates
9. Quantitative estimation of protein - Lowery method
10. Estimation of DNA by diphenylamine reagent
11. Estimation of RNA by orcinol reagent