**M.Sc., (Previous) BIOTECHNOLOGY**

**I SEMESTER**

# BT 1.1: CELL BIOLOGY and EVOLUTION

## UNIT-I

Structure of typical bacterial, plant and animal cells and functions of cell organelles.Mechanism of Cell division. Cell cycle – Molecular events including cell cycle check points and Cdk – cyclin complexes and their role in cell cycle regulation. Ultra structure of Plasmamembrane - Components and membrane asymmetry. Transport processes - active transport, ionophores and ion channels. Exo and endocytosis.Phago and pinocytosis.

## UNIT-II

General morphology and functions of Endoplasmic reticulum. Signal hypothesis. Ribosomes - Eucaryotic and Procaryotic. Ribosomal proteins.Role of Golgi in protein secretion.Lysosomes and Peroxisomes.Cytoskelatal elements.Cell – cell interaction.

## UNIT-III

Mitochondria - structure, biogenesis and enzymatic compartmentation. Organization of Mitochondrial respiratory chain, mechanism of oxidative of phosphorylation. Ultra structure of the Chloroplast. Photosynthesis - photophosphorylation. Carbon dioxide fixation in C-3, C-4 and CAM plants.Photorespiration.

## UNIT-IV

Organic evolution: Origin of life. Species concept, population, dones, races, and subspecies.Mechanisms of speciation.Role of isolating mechanisms. Lamarckism, Darwinism, Neo-Darwinism, synthetic theory of evolution. Micro, macro and mega evolution, sequential and divergent evolution.Natural selection.

**BOOKS RECOMMENDED:**

1. Molecular Biology of the Cell by B.Alberts et.al (Garland publicationsincorporation.).

2. Molecular Cell Biology, J. Darnell et. al (Scientific American Books) .

3. Cell Biology by N.O.Thorpe (John wiley& sons).

4. Organic Evolution by Rastogi.

5.Principles of organic evolution by J.L.Stebbins (Prentic Hall).

**M.Sc., (Previous) BIOTECHNOLOGY**

**I SEMESTER**

**BT 1.2: BIOMOLECULES**

**UNIT-I**

Chemical foundations of Biology – pH, pK, acids, bases, buffers, weak bonds and covalent bonds.Classification, structure, properties and biological significance of carbohydrates.Monosaccharides, Disaccharidesand Polysaccharides. Biological role of Peptidoglycans, Glycosaminoglycans and Lectins. Lipids - classification, structure and properties of fatty acids, triglycerides, phospholipids, sphingolipids and cholesterol.

## UNIT-II

Amino acids - Classification, structure and physico-chemical properties.Chemical synthesis of peptides – solid phase peptide synthesis. Proteins - classification, purification and criteria of homogeneity. Structural organization, sequence determination and characterization of proteins. Confirmation of proteins – Ramachandran plots. Denaturation of proteins.Hetero cyclic compounds – Heme and Chlorophylls.

**UNIT-III**

Structure and properties of purines, pyrimidines, nucleosides, and nucleotides.Covalent structure of DNA and different forms of DNA - A,B and Z. DNA super coiling.Types of RNA and covalent structure of t-RNA.Classification, structure and physiological roles of Vitamins.

**UNIT-IV**

Hormones- classification and mechanism of action of steroid and protein hormones. Signal transduction cascade by cyclic AMP, Phosphoinositate and calcium (Ca+), G-proteins, growth factors and membrane receptor tyrosine kinases. Phytohormones and their physiological roles.

**BOOKS RECOMMENDED:**

1. Principles of Biochemistry by A.L.Lehninger, 2 Ed. (worth).
2. Biochemistry by L.Stryer 4 Ed. (Freeman-Toppan).
3. Text Book of Biochemistry by West et. al., (Mac Millan).
4. Principles of Biochemistry by Smith et. al., (McGraw Hill).
5. Harper’s Biochemistry (Langeman).
6. Biochemistry by D.Voet and J.G.Voet (John weily).
7. Biochemistry by U. Satyanarayana (Books & Allied (P) Ltd).

**M.Sc., (Previous) BIOTECHNOLOGY**

**I SEMESTER**

**BT 1.3: MICROBIAL PHYSIOLOGY & GENETICS**

# UNIT-I

Classification and cultivation of Bacteria. Bacterial reproduction and Growth curve. Preparation of Bacteriological media.Staining techniques. Differences between Gram positive and Gram negative bacteria. Methods of Sterilization, Pasteurization and Disinfection.Microbiology of water, milk, air, soil and sewage.Clinically important bacteria. Biohazards - safety precautions.

**UNIT-II**

Chemical nature and classification of Bacteriophages.Parasitic and temperate phages.Plant and animal viruses – multiplication of viruses.General characteristics of T Phase, φx174, SV40, TMV.Clinically important viruses, retroviruses, HIV, Hepatitis B Virus and viral infections.General account of Algae,Molds and Yeasts.Economic importance of Algae and Fungi.Clinically significant protozoans.

**UNIT – III**

Microbial genetics: Recombination in Prokaryotes.Transformation, Conjugation, Transduction and Sexduction.Mapping of prokaryotic gene.Transposons, retrotransposons and mechanism of transposition.Viral genetics.Biology of plasmids.Extra chromosomal inheritance.

**UNIT-IV**

Genetics of Eukaryotes: Gene & Environment, Genotype and phenotype, Mendel’s experiments, Dominance relationships. Multiple alleles, Gene Interaction, Gene mutations, Sex determination, Sex linkage, Linkage and recombination in diploids.Tetrad analysis.Elements of gene mapping, Pedigree analysis.

**BOOKS RECOMMENDED:**

1. Text book of Microbiology by Pleczar and Reid (McGraw Hill).

2. Microbiology by Tortora, Funk & Case.

3. Microbiology by Prescott.

4. Principles of Genetics by Sinnet et.al,., (McGraw Hill).

5. Principles of Heridity by Robert Tumarin.

6. Genetics by M.W.Strick Berger (Mac Millan).

7.Cell and Molecular Biology by E,D.P.DeRoberties (International edition).

**M.Sc., (Previous) BIOTECHNOLOGY**

**I SEMESTER**

# BT 1.4: ANALYTICAL TOOLS AND TECHNIQUES IN BIOTECHNOLOGY

# UNIT-I

Principles and applications of light, phase contrast, fluorescence, scanning and transmission electron microscopy. Properties of electromagnetic radiations.Principles, instrumentation and applications of UV, visible, NMR spectroscopy.Mass spectrometry, X-ray diffraction. Flow cytometry.

**UNIT-II**

Principles and applications of gel-filtration, ion-exchange and affinity chromatography.TLC, GLC and HPLC.Basic principles of sedimentation.Applications of preparative and analytical ultra centrifuges.Principles and applications of lyophilization.

**UNIT-III**

General principles of electrophoretic techniques.Poly Acryl amide Gel Electrophoresis.Iso-electric focusing.Isotachophoresis.2-D Electrophoresis.Capillary electrophoresis.Agarose gel electrophoresis of DNA and RNA.Blotting techniques.DNA fingerprinting.

**UNIT-IV**

Stable and radioactive isotopes.Detection and measurement of radioactivity.Applications of radioisotopes in biological sciences.Autoradiography.Non-isotopic tracer techniques.Principles and range of electrochemical techniques.Operation of pH electrodes.Principles and applications of Ion-selective and gas sensing electrodes.Oxygen electrodes.

**BOOKS RECOMMENDED**

1.Analytical Biochemistry by David J.Holme (Long man).

2.A Biologists guide to Principles and techniques of practical Biochemistry. Ed.by.B.D.williams (Edward Arnold).

3.Instrumental methods of chemical analysis by G.K.Sharma (Goel).

4.Modern experimental Biochemistry by Rodney Boyer (Pearson Education).

5.Physical Biochemistry by Frefielder (Freeman & Co).

6.Biophysical chemistry principles and techniques by Upadyay, Upadyay and Nath ( Himalaya publishing).

7.Instrumental methods of chemical analysis by Chatwal&Anand.