

# Biotechnology

## **B.Sc. I Semester I (Paper I): Cell and Cell Organelles.**

**Credits: - 2**

**After completion of this course, the students will be able to –**

**CO1:** Understand the discovery, structure and function of the cell and cell organelles

**CO2:** Understand the structure and function of the actin filaments, microtubules, microtubule motor and intermediates.

**CO3:** Understand dynamic instability and tubulin synthesis and modification.

**CO4:** Understand the cell division and cell cycle. Understand the stages of mitosis and meiosis

## **B.Sc. Semester – I (Paper II): General Microbiology.**

**Credits: 2**

**After completion of this course, the students will be able to –**

**CO1:** Understand about the history and development of microbiology.

**CO2:** Understand the principle, working mechanism of microscopy. Students will be able to use, handling and care of microscope.

**CO3:** Understand about morphology of microbes.

**CO4:** Understand the various staining technique and learn about morphological aspect of bacteria.

**CO5:** Understand the various technique used for the cultivation of bacteria.

**CO6:** Understand the microbial growth rate, details of growth curve and its phases.

**CO7:** Understand nutrition which is required for growth of micro-organism and understand the methods of microbial control.

## **Practical – Semester-I: Credits: 2**

**After completion of this course the students will be able to –**

**CO1:** Understand, Use, care and handle the instruments used in microbiology laboratory. Skills and application of instruments will help students in their future.

**CO2:** Gain knowledge of various staining technique and bacterial structure.

**CO3:** Understand the isolating of pure culture by streak plates and pour plates methods.

**CO4:** Use the different isolation technique. They will be able to isolate microbial pure by performing various isolation techniques.

**CO5:** Understand the motility of bacteria by hanging drop method.

**CO6:** Perform microscopic observation of stomata and root hairs to understand the cell structure.

**CO7:** Perform antibiotic sensitivity test to understand the microbial control.

## **B. SC. – I (Semester II): Paper I – Biochemistry. Credits:2**

**After completion of this course the students will be able to –**

**CO1:** Understand the fundamental of biochemistry.

**CO2:** understand chemical structure and base composition of nucleic acids and structure of m-RNA t-RNA, r-RNA

**CO3:** understand study about classification structure and types of carbohydrates, proteins and vitamins.

**CO4:** Understand the structure and classification of amino acids and protein.

**CO5:** Understand secondary tertiary and quaternary structure of proteins.

## **B. Sc. –I (Semester II): Paper II– Genetics**

**Credits :2**

**After completion of this course students will be able to:**

**CO1:** Understand the Mendel's law of inheritance, law of Dominance and derivation from Mendel's law.

**CO2:** Understand the linkage and sex linkage and sex determination in plant and animals .

**CO3:** understand the concept of crossing over and mechanism of crossing over.

**CO4:** understand the chromosomal aberration in plants and animals.

**CO5:** understand the basic idea of Natural selection, Genetic Drift, Gene flow and genetic disorders

## **PRACTICAL - SEMESTER II: Credits: 2**

**After completion of this course students will be able to:**

**CO1:** understand the quantitative analysis of carbohydrates, proteins and lipids.

**CO2:** understand the estimation of proteins by Lowery method, sugar by DNS method, DNA by DPA method and RNA by Orcinol method.

**CO3:** understand the effect of osmotic pressure

**CO4:** understand the verification of Mendel's law.

## **B.Sc.II (Semester III): Paper - I: Cell metabolism. Credits-2**

**After completion of this course students will be able to:**

**CO1:** understand the concept of energy, entropy, enthalpy and redox potential.

**CO2:** understand the energy charge and its relation to metabolic regulation..

**CO3:** understand different pathways such as glycolysis glyconeogenesis, TCA, electron transport chain glycogenesis and glycogenolysis.

**CO4:** understand the biosynthesis of fatty acids and the diseases of fat metabolism.

**CO6:** understand different metabolic pathways necessary for Bacterial survival.

**C07:** understand biosynthesis of purine and pyrimidines

**B.Sc. II (Semester III): Paper II: Molecular biology and Enzymology**

**Credits: 2**

**After completion of this course students will be able to**

**C01:** understand the nomenclature and classification of enzymes .

**C02:** understand the mechanism of action-Activation energy, Lock and key model Koshland model.

**C03:** understand the mechanism of enzyme catalysis, enzyme kinetics and enzyme inhibition.

**C04:** understand the replication and transcription in prokaryotes.

**C05:** understand the genetic codes.

**C06:** understand protein synthesis.

**Practical: B.Sc. II: Semester III: Credits - 2**

**After Completion of this course students will be able to-**

**C01:** understand the isolation of RNA from bacteria.

**C02:** understand the determination of  $V_{max}$  and  $K_m$  for  $\alpha$ -amylase enzyme

**C03:** understand the effect of substrate concentration of enzyme activity.

**C04:** understand immobilization of enzymes in alginate gel..

**C05:** understand effect of pH on enzyme activity

**B.Sc. II (Semester IV): Paper I: Biophysical Techniques. Credits-2**

**After completion of this course work students will be able to -**

**C01:** Understand the instrumentation and application of UV visible spectrophotometer.

**C02:** Understand concept of Lambert- Beer's law

**C03:** understand the different types of Chromatography technique

**C04:** understand details study of electrophoresis.

**C05:** understand the concepts and types of centrifuge.

## **B.Sc. II: (Semester IV) :Paper II: Immunology and Biostatistics.**

**Credit: 2**

### **Out comes: After completion of this course work-**

- C01:** Student will be able to understand the concepts of immunity and their classification.
- C02:** Students will be able to understand innate immunity and humoral immunity.
- C03:** Student will be able to understand the production of wine, ethanol, citric acid, penicillin by fermentation process.
- C04:** Students will be able to understand the hypersensitivity and vaccination.
- C05:** Students will be able to understand the antigen-antibody interaction and various immunological techniques.
- C06:** Students will be able to understand central tendency, measures of dispersion.
- C07:** Students will be able to understand various methods of sampling and also understand various methods of presentation of statistical data.

## **B.Sc. II: (Semester IV) Practical:**

### **Out comes: After completion of this course work-**

- C01:** Student will be able to understand procedure of agarose gel electrophoresis of nucleic acid.
- C02:** Students will be able to understand the method of SDS-PAGE
- C03:** Students will be able to understand absorption spectrum of oxy- and deoxyhaemoglobin. And Spectrophotometric titration of proteins.
- C04:** Students will be able to understand Protein estimation by E280/E260 method and Paper chromatography of amino acids/sugars and TLC of lipid/amino acids.
- C05:** Antigen- antibody reactions, blood group testing, pregnancy test and widal test(quantitative).
- C06:** Radial immunodiffusion and ELISA, Cellular fractionation and separation of cell organelles using centrifuge.
- C07:** Calculation of mean, median and mode (manual / computer aided) and Calculation of standard deviation and standard error (manual / computer aided) and Biostatistical problem based on standard deviation.
- C08:** Student will be able to understand the Computer presentation of statistical data, chart and diagrams.

### **B. Sc. III (Semester V): Paper I: Genetic Engineering: Credits:2**

#### **Outcomes: After completion of this course-**

**CO1:** Students will be able to understand basic of genetic engineering, isolation and amplification of DNA.

**CO2:** Students will be able to understand cloning vector such as plasmid, cosmid, phagemoid vector.

**CO3:** Students will be able to understand insertion of foreign DNA into a vector.

**CO4:** Students will be able to understand mechanism of transformation and transfection.

**CO5:** Students will to understand gene therapy.

**CO6:** Students will able to understand the procedure of production of monoclonal antibodies.

### **B.Sc .III (Semester V): Paper II: Plant Biotechnology**

#### **After completion of this course-**

**CO1:** Students will be able to understand the general introduction and history of cell and tissue culture techniques.

**CO2:** Students will be able to understand the techniques of rapid clonal propagation and production of virus free plant..

**CO3:** Students we will be able to understand the technique of production of haploid plant

**CO4:** Students will be able to understand the mechanism of DNA transfer, role of virulence genes, use if Ti and Ri as vector.

**CO5:** Students will be able to understand brief idea of chloroplast transformation.

**CO6:** Students will be able to understand the application of plant tissue culture.

#### **Practical B.Sc. III: Semester V: Practical, Credits: 2**

**CO1:** Students will be able to understand the procedure of isolation of genomic DNA and plasmid DNA

**CO2:** Students will be able to understand the procedure of restriction digestion of DNA.

**CO3:** Students will be able to understand the procedure of DNA amplification by PCR method.

**CO4:** Students will be able to understand how plant tissue culture media will be prepared.

C05: Students will be able to understand the construction of recombinant DNA and amplification DNA.

### **B.Sc III (Semester VI): Paper I: Environmental Biotechnology. Credits: 2**

#### **After completion of this course-**

**C01:** Students will be able to understand environmental education , problems and need.

**C02:** Students will be able to understand ozone depletion, green-house effect and acid rain.

**C03:** Students will be able to understand water pollution and waste water treatment.

**C04:** Students will be able to understand the basic concept of xenobiotics and its types.

**C05:** Students will be able to understand the bioleaching of heavy metals such as copper and mercury.

**C06:** Students will be able to understand the biochemical cycles: nitrogen carbon and sulfur cycle.

**C07:** Students will be able to understand the biofertilizers, biopesticides and its types.

### **B.Sc. III (Semester VI) Paper II: Animal Biotechnology Credits: 2**

#### **After completion of this course students will be able to:**

**C01:** understand the concept of animal cell culture.

**C02:** understand the chemical, physical, and metabolic function of different constituents of culture media for cell culture.

**C03:** understand the methods of animal tissue culture.

**C04:** understand the techniques of cell transformation, cell synchronization and cell manipulation.

**C05:** understand the three dimensional cultures.

**C06:** understand the application of animal tissue culture..

**Practical (semester VI): Practical: Credits:2**

**After completion of this course-**

**C01:** Students will be able to understand the determination of oxygen demand (COD) of sewage sample.

C02: Students will be able to understand the production of microbial fertilizers.

C03: Students will be able to understand the determination of hardness alkalinity of water sample.

C04: Students will be able to understand the biochemical oxygen demand of sewage sample.

C05: Students will be able to understand the cell count by hemacytometer(RBC/WBC)

C06: Students will be able to understand the microtomy-fixation, dehydration, embedding, sectioning and staining of animal tissue.