

## **Foundation Course for Applied Biotechnology and Bioinformatics**

**Microbiology:** Prokaryotic and eukaryotic cell structure; Microbial genetics (plasmids, transformation, transduction, conjugation)

**Biochemistry:** Chemical and functional nature of enzymes; Bioenergetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; Cell cycle and cell growth control; Cell signaling and signal transduction.

**Molecular Biology and Genetics:** Molecular structure of genes and chromosomes; DNA replication and control; Transcription and its control; Translational processes; Regulatory controls in prokaryotes and eukaryotes; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extra chromosomal inheritance; Chromosomal variation; Population genetics; Transposable elements, Molecular basis of genetic diseases and applications.

**Recombinant DNA Technology:** Restriction and modification enzymes; Vectors: plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; cDNA and genomic DNA library; Gene isolation; Gene cloning; Expression of cloned gene; Transposons and gene targeting; DNA labeling; DNA sequencing; Polymerase chain reactions; DNA fingerprinting; Southern and northern blotting; In-situ hybridization; RAPD; RFLP; Site directed mutagenesis; Gene transfer technologies; Gene therapy.

**Bioinformatics:** Major Bioinformatics resources (NCBI, EBI, ExPASy); Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, scoring matrices, sequence alignment, phylogeny); Genomics and Proteomics (Large scale genome sequencing strategies; Comparative genomics; Understanding DNA microarrays and protein arrays); Molecular modeling and simulations (basic concepts including concept of force fields).

### **Text Books/ References:**

Microbiology: Pelczar, 1998. *Microbiology*. 5th edition Edition. McGraw-Hill Inc., US.

Biotechnology: Singh, B D , 2003. *Biotechnology expanding horizons*. 4th ed. New Delhi: Kalyani publishers.

Biochemistry: U, Sathyanarayana, 2013. *Biochemistry*. 4th ed. New Delhi: Elsevier.

Bioinformatics: Ghosh, Zhumur, 2008. *Bioinformatics: Principles and Applications*. 1st ed. New Delhi: OUP India.