

2. LIFE SCIENCES

There are seven subjects and students can choose any three

- 2.1 Cell Biology:** Cell Structure and Function; Organelles; Cell Cycle and Cellular Reproduction; Transport Across Cell Membranes; Receptors & Cell Signalling; Gene Organization and Regulation of Gene Expression in Prokaryotes and Eukaryotes; Replication; Transcription and Translation.
- 2.2 Immunology:** The origin of immunology; Inherent immunity; Humoral and cell mediated immunity; Primary and secondary lymphoid organ; Antigen; B and T cells and Macrophages; Major histocompatibility complex (MHC); Antigen processing and presentation; Synthesis of antibody and secretion; Molecular basis of antibody diversity; Polyclonal and monoclonal antibody; Complement; Antigen–antibody reaction; Regulation of immune response; Immune tolerance; Hyper sensitivity; Autoimmunity; Graft versus host reaction.
- 2.3 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).
- 2.4 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; Mendelian inheritance; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extrachromosomal inheritance; Chromosomal variation; Population genetics; Transposable elements, Molecular basis of genetic diseases and applications.
- 2.5 Biochemistry:** Biomolecules and their conformation; Weak inter–molecular interactions in biomacromolecules; Chemical and functional nature of enzymes; Kinetics of single substrate and bi–substrate enzyme catalyzed reactions; Bioenergetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; cell growth control; signal transduction.
- 2.6 Microbiology:** Prokaryotic and eukaryotic cell structure; Microbial nutrition, growth and control; Microbial metabolism (aerobic and anaerobic respiration, photosynthesis); Nitrogen fixation; Chemical basis of mutations and mutagens; Microbial genetics (plasmids, transformation, transduction, conjugation); Microbial diversity and characteristic features; Viruses.
- 2.7 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.

Soil microorganisms associated with vascular plants.