

Syllabus for M.Sc Biotechnology

1. Biomolecules structure and functions; Biological membranes, structure, action potential and transport processes; Enzymes- classification, kinetics and mechanism of action; Basic concepts and designs of metabolism (carbohydrates, lipids, amino acids and nucleic acids) photosynthesis, respiration and electron transport chain
2. Prokaryotic and eukaryotic cell structure; Cell cycle and cell growth control; Cell-Cell communication, Cell signaling and signal transduction, Animal cell culture; Anchorage and non-anchorage dependent cell culture; Kinetics of cell growth; Stem cell technology;
3. Molecular structure of genes and chromosomes; Mutations and mutagenesis; Nucleic acid replication, transcription, translation and their regulatory mechanisms in prokaryotes and eukaryotes; Mendelian inheritance; Complementation; Linkage, genetics (plasmids, transformation, transduction, conjugation); Horizontal gene transfer and Transposable elements; Organelle DNA, Satellite-and repetitive DNAs, RNA interference for gene silencing; DNA damage and repair; Chromosomal variation; and DNA repair.
4. History of Immunology; Innate, humoral and cell mediated immunity; Antigen; Antibody structure and function; Synthesis of antibody and secretion; Antigen-antibody reaction; Complement; Primary and secondary lymphoid organ; B and T cells and macrophages; Major histocompatibility complex (MHC); Antigen processing and presentation; Polyclonal and monoclonal antibody; Regulation of immune response, Hybridoma technology;
5. Restriction and modification enzymes; Vectors; plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; mammalian and plant expression vectors; cDNA and genomic DNA library; cloning and expression; Transposons and gene targeting; DNA labeling; DNA sequencing; Polymerase chain reactions; DNA fingerprinting; Southern and northern blotting; RAPD, RFLP; Site-directed mutagenesis; Gene transfer technologies; Gene therapy, DNA fingerprinting
6. Viruses- structure and classification; Microbial classification and diversity (bacterial, algal and fungal); Methods in microbiology; Kinetics of Microbial growth and nutrition; Aerobic and anaerobic respiration; Nitrogen fixation; Microbial diseases and host-pathogen interaction
7. Tissue culture and its application, Micropropagation. Meristem culture and production of virus-free plants. Anther and microspore culture. Embryo and ovary culture. Protoplast isolation. Protoplast fusion-somatic hybrids, cybrid. Synthetic seeds. In vitro germplasm conservation. Methods of gene transfer in plants. Achievements and recent developments of genetic engineering in agriculture.
8. Principles of microscopy-light, electron, fluorescent and confocal; Centrifugation- high speed and ultra; Principles of spectroscopy-UV, visible, FTIR, Raman, MS, NMR; Principles of chromatography- ion exchange, gel filtration, affinity, GC, HPLC, Electrophoresis; Microarray.
9. Major Bioinformatics resources and search tools; Sequence and structure databases; Data mining and analytical tools for genomic and proteomic studies
10. Structure of Atom, Classification of Elements and Periodicity in Properties, Chemical Bonding and Molecular Structure, Thermodynamics, Redox Reactions, s-Block Element (Alkali and Alkaline earth metals), Hydrocarbons, Electrochemistry, Chemical Kinetics, Surface Chemistry,

Haloalkanes and Haloarenes, Alcohols, Phenols and Ethers, Aldehydes, Ketones and Carboxylic Acids, Organic Compounds Containing Nitrogen

11. Laws of Motion, Work, Energy and Power, Motion of System of Particles and Rigid Body, Gravitation, Oscillations and Waves, Electrostatics, Current Electricity, Magnetic Effects of Current and Magnetism, Electromagnetic Induction and Alternating Currents, Electromagnetic Waves, Optics, Dual Nature of Matter and Radiation, Atoms and Nuclei.
12. A New Approach to Reasoning - Verbal, Non-Verbal and Analytical