

Code: BT**BIOTECHNOLOGY****Engineering Mathematics****Linear Algebra:** Matrices and Determinants, Systems of Linear Equations, Eigen Values and Eigen Vectors.**Calculus:** Limit, Continuity and Differentiability, Partial Derivatives, Maxima and Minima, Sequences and Series, Test for Convergence, Fourier Series.**Differential Equations:** Linear and Nonlinear First Order Odes, Higher Order Odes with Constant Coefficients, Cauchy's and Euler's Equations, Laplace Transforms, PDE- Laplace, Heat and Wave Equations.**Probability and Statistics:** Probability and Sampling Theorem, Conditional Probability, Mean, Median, Mode and Standard Deviation, Random Variables, Poisson, Normal and Binomial Distributions, Correlation and Regression Analysis.**Numerical Methods:** Solution of Linear and Nonlinear Algebraic Equations, Integration of Trapezoidal and Simpson's Rule, Single and Multistep Methods for Differential Equations.**Bio-Technology****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.**Biochemistry:** Biomolecules and Their Conformation; PH,pk,Solutions,buffers and water,Weak Inter-Molecular Interactions and 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 Cycle and Cell Growth Control; General modes of 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; Mendelian Inheritance; Gene Interaction; Complementation; Linkage, Recombination and Chromosome Mapping; Extra Chromosomal Inheritance; Chromosomal Variation; Population Genetics-Hardy Weinberg Law; Transposable Elements, Molecular Basis of Genetic Diseases and Applications.**Process Biotechnology:** Bioprocess Technology for the Production of Cell Biomass and Primary/Secondary Metabolites, such as Baker's Yeast, Ethanol, Citric Acid, Amino Acids, Exopolysaccharides, Antibiotics and Pigments Etc.; Microbial Production, Purification and Bioprocess Application(S) of Industrial Enzymes; Production and Purification of Recombinant Proteins on a Large Scale; Chromatographic and Membrane Based Bioseparation Methods; Immobilization of Enzymes and Cells and their Application for Bioconversion Processes. Aerobic and Anaerobic Biological Processes for Stabilization of Solid / Liquid Wastes; Bioremediation.

Bioprocess Engineering: Kinetics of Microbial Growth, Substrate Utilization and Product Formation; Simple Structured Models; Sterilization of Air and Media; Batch, Fed-Batch and Continuous Processes; Aeration and Agitation; Mass Transfer and Bioreactors; Rheology of Fermentation Fluids; Scale-Up Concepts; Design of Fermentation Media; Various Types of Microbial and Enzyme Reactors; Instrumentation and Bioreactors. Enzyme based biosensors

Plant Biotechnology: Special Features and Organization of Plant Cells; Totipotency; Regeneration of Plants; Plant Products of Industrial Importance; Autotrophic and Heterotrophic Growth; Plant Growth Regulators and Elicitors; Cell Suspension Culture Development: Methodology, Kinetics of Growth and Product Formation, Nutrient Optimization; Production of Secondary Metabolites by Plant Suspension Cultures; Hairy Root Cultures and Their Cultivation. Techniques and Raising Transgenics.

Animal Biotechnology: Animal Cell Culture- Metabolism, Regulation and Nutritional Requirements for Mass Cultivation and preservation of Animal Cell Cultures; Kinetics of Cell Growth and Product Formation and Effect of Shear Force; Product and Substrate Transport; Micro & Macro-Carrier Culture; Hybridoma Technology, Transfection; Live Stock Improvement; Cloning of Animals

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 Vs Host Reaction, Types of Vaccines-Salk, Sabin, DNA based, mRNA based and Protein based .

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; and-Situ Hybridization; RAPD; RFLP; Site-directed Mutagenesis; Gene Transfer Technologies; Gene Therapy, Basics of CRISPR- cas technology.

Bioinformatics: Major Bioinformatics Resources (NCBI, EBI, Ex Pasy); Sequence and Structure Databases; Sequence Analysis (Bimolecular Sequence File Formats, Scoring Matrices, Sequence Alignment, Phylogeny); Genomics and Proteomics (Large Scale Genome Sequencing Strategies; Comparative Genomics; Understanding DNA Micro Arrays and Protein Arrays); Molecular Modeling and Simulations (Basic Concepts Including Concept of Force Fields).
