

# TS PGECET Biotechnology Syllabus 2025

Name of the subject	Name of the topics	Name of the sub-topics
Engineering Mathematics	Linear Algebra	Matrices and Determinants, Systems of Linear Equations, Eigenvalues and Eigenvectors
	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.
Biotechnology	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; Livestock 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, ExPasy); 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 Microarrays and Protein Arrays); Molecular Modeling and Simulations (Basic Concepts Including Concept of Force Fields)
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