

## JIIT NOIDA

### Syllabus of PGET-2023

#### M. Tech – Biotechnology

#### GENERAL SCIENCE

##### **Biostatistics:**

Probability, Major of central tendency and dispersion: Mean, Median, Mode, standard deviation, standard error of mean, skewness, kurtosis; Testing of hypothesis: Z-statistics, t-statistics, F-statistics, correlation regression, chi-square test

##### **Physics:**

Laws of thermodynamics, Concept of entropy, Applications to compression and expansion processes. Solution thermodynamics - Excess properties of mixtures, Concept of free energy,

##### **Chemistry:**

Concept of pH and buffer, Chemical bonding and hybridization, Atomic and molecular structure, Chemical reaction equilibrium, Chemical reaction mechanism (SN1 and SN2), Chemical kinetics (first & second order)

##### **Computer Science:**

Introduction to logic (binary, decimal, hexa decimal number conversions), Flow diagram

#### BIOLOGICAL SCIENCES

##### **Biochemistry**

Biomolecules and their conformation; Enzyme kinetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; , Photorespiration; Mechanism of enzyme action; Enzyme kinetics; Enzyme inhibition; Allosteric enzymes, basics of metabolism; biochemical techniques

##### **Cell and Molecular Biology**

Cell division; Cell Organelles; Cell Membrane and Cell Wall; Cell cycle, Mitosis and Meiosis; & Molecular controls; Cell signalling: GPCR and Role of second messenger (cAMP);

Central dogma of molecular biology; Structure of DNA and RNA, DNA super coiling, DNA damage and repair; DNA replication; DNA transcription and RNA processing; Transcription regulation in prokaryotes; Post transcriptional modification of eukaryotic mRNA; RNA interference; Genetic code and protein synthesis,

##### **Genetics and Developmental Biology**

Principles of inheritance, gene and genome; Linkage: concept, linkage maps. Crossing over: concept and significance, Types of mutations, effects of physical & chemical mutagens; Population genetics; Genetic disorders.

Early Embryonic Development in plants and animal: Gametogenesis, Spermatogenesis, Oogenesis; Fertilization (External and Internal): In vitro fertilization; Stem cell (ESC), Amniocentesis, teratology

## **Immunology**

Basic immunology; Cell and molecules involved in innate immunity Adaptive immunity (Cell mediated and humoral); Antibody structure; Complement system; Antigen-antibody interactions; Autoimmunity; Hyper-sensitivity; Hybridoma technology; Immunoassays (ELISA and RIA); Monoclonal antibodies in diagnosis and therapeutics; Vaccines.

## **Introduction to Bioinformatics**

Biological databases; Primary, secondary and composite databases; Nucleic acid databases (GenBank, DDBJ, EMBL and NDB); Protein databases (PIR, SWISS-PROT, TrEMBL, PDB); Methods of Alignment (Dot matrix, Dynamic Programming, BLAST and FASTA); Local and global alignment, pair wise and multiple sequence alignments; Similarity, identity and homology of sequences, construction of phylogenetic trees, interpretation of trees.

## **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; DNA sequencing; Polymerase chain reactions; Reverse Transcriptase-PCR; DNA fingerprinting; Southern and northern blotting; In-situ hybridization; RAPD; RFLP; Site-directed mutagenesis; Gene transfer technologies; Gene therapy.

## **Basic techniques in Biotechnology**

Principle and application of microscopy; filtration; centrifugation; spectroscopy (UV/Visible, NMR, IR), Electrophoresis; chromatography (TLC, HPLC, GC, ion exchange, affinity, gel filtration); lyophilization; Western Blotting.

## **Microbial & Plant Biotechnology**

Microbial nutrition, growth and control; Microbial metabolism (aerobic and anaerobic respiration, photosynthesis); Microbial genetics (plasmids, transformation, transduction, conjugation); Microbial diversity and characteristic features; Viruses; Host-pathogen interactions, role of microbes in industry.

Industrial enzymes; Enzyme immobilization; Types of bioreactors; Bioseparation techniques, Numerical related to Bioprocess technology; Mass Balance calculations, Concept of plant cellular totipotency; Clonal propagation; Organogenesis and somatic embryogenesis, artificial seed, somaclonal variation, embryo culture, *in vitro* fertilization; Plant products of industrial importance; Plant-microbe interactions.

## **Biodiversity& Environmental Biotechnology**

Concept of biodiversity, biodiversity hotspots, treaties and conventions related to biodiversity, Importance of Medicinal Plants; Bio-Propecting and Bio-Piracy, Bioremediation; Biofertilizers; Organic farming, Recycling of bio- degradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting, Environmental pollution, GMO's and related ethical issues, sustainability.