GATE 2015 syllabus for Biotechnology

General Aptitude (GA)-Multiple Choice Test

- ⏱ **This Paper Consists of Verbal Ability:** English grammar, verbal analogies, instructions, critical reasoning and verbal deduction, Sentence completion, Word groups.

ENGINEERING MATHEMATICS-Mathematical branch that includes mathematical methods and techniques that are generally employed in Industry and engineering

- ⏱ **Linear Algebra: Mathematical branch which does study of operation and applying it to find an answer to equations**.It include topics- Determinants and matrices, Systems of linear equations, Eigen vectors and Eigen vaules.
- ⏱ **Calculus:Mathematical study of change** .It include topics- continuity,limit and differentiability, Partial derivatives, Minima and maxima, Sequences and series, Fourier Series, Test for convergence.
- ⏱ **Differential Equations: Deals with rate of change and slope of curves.**It include topics- Non-Linear and linear first order ODEs, higher order ODEs with constant coefficients, Euler's and Cuachy's equations,Laplace transforms, PDE- Laplace, wave and heat equations.
- ⏱ **Probability and Statistics:Probability is the way to roughly judge the occurrence of a thing or to what extent a statement is true.**It include topics- median, Mean, mode and standard deviation, Random variables, Poisson, binomial and normal distributions, Correlation and regression analysis.
- ⏱ **Numerical Methods: It consists of set of rules which uses numerical approximation to find an answer to the problems of mathematical analysis**.It include topics-Solution of linear and nonlinear algebraic equations, Integration of Simpson's and Trapezoidal rule, Multi step and single step methods for differential equations.

BIOTECHNOLOGY

- ⏱ **Microbiology:Detail analysis of microscopic organisms.It include topics-** Eukaryotic and Prokaryotic cell structure; Microbial nutrition, control and growth; Microbial metabolism (anaerobic and aerobic respiration, photosynthesis); Nitrogen fixation; Chemical basis of mutagens and mutation; Microbial genetics (plasmids, transduction,transformation, conjugation); Microbial diversity and characteristic features; Viruses.

- **Biochemistry:Analysis of chemical processes within and related to living organisms**.It include topics- Biomolecules and their conformation; Weak inter-molecular interactions in biomacromolecules; Kinetics of single substrate and bi-substrate enzyme catalyzed reactions; Chemical and functional nature of enzymes ;Bioenergetics; Metabolism (TCA and Oxidative phosphorylation, Glycolysis); Membrane transport and pumps; Cell cycle and cell growth control; Cell signaling and signal transduction.
- **Molecular Biology and Genetics: Deals with the molecular basis of biological activity and genetics is detail study of genes.**It include topics-Molecular structure of genes and chromosomes; DNA replication and control; Translational processes; Transcription and its control; Regulatory controls in prokaryotes and eukaryotes; Mendelian inheritance; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extrachromosomal inheritance; Chromosomal variation; Population genetics; Molecular basis of genetic diseases and applications, Transposable elements.
- **Process Biotechnology:All about basic aspects of biotechnology.**It include topics-Bioprocess technology for the production of cell biomass and primary/secondary metabolites, such as baker's yeast, citric acid,ethanol, amino acids, exo-polysacharides, pigments and antibiotics 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.
- Anaerobic and aerobic biological processes for stabilization of solid / liquid wastes; Bioremediation.
- **Bioprocess Engineering:Deals with the planning,development of equipment and processes to make products like food,feed,chemicals etc on a large scale.**It include topics- Kinetics of microbial growth, substrate utilization and product formation; Simple structured models; Batch, fed-batch and continuous processes; Sterilization of air and media ;Aeration and agitation; Rheology of fermentation fluids; Mass transfer in bioreactors; Scale-up concepts; Various types of microbial and enzyme reactors; Instrumentation in bioreactors;Design of fermentation media.
- **Plant and Animal Biotechnology: Deals with the accumulation of all scientific techniques that can be used to create,modify plants,animals.**It include topics-Special features and organization of plant cells; Totipotency; Regeneration of plants;Biochemistry of major metabolic pathways and products; Autotrophic and heterotrophic growth; Plant products of industrial importance ;Plant growth regulators and elicitors; Cell suspension culture development: kinetics of growth, methodology,and production formation, nutrient optimization; Production of secondary metabolites by plant suspension cultures; Hairy root cultures and their cultivation. Techniques in raising transgencies.
- **Characteristics of animal cells: Eukaryotic cells which contains membrane bound organelles and its various traits.**It include topics- Metabolism, regulation and nutritional requirements for mass cultivation of animal cell cultures; Product and

substrate transport; Kinetics of cell growth and product formation and effect of shear force; Hybridoma technology; Live stock improvement; Cloning in animals; Genetic engineering in animal cell culture; Micro & macro-carrier culture; Animal cell preservation.

⏱ **Immunology:It deals with all features of the immune system in all organisms.It include topics-** The origin of immunology; Humoral and cell mediated immunity; Inherent immunity; Primary and secondary lymphoid organ; Antigen; T and B cells and Macrophages; Major histocompatibility complex (MHC); Synthesis of antibody and secretion; Antigen processing and presentation; Molecular basis of antibody diversity; monoclonal and polyclonal antibody; Complement; Regulation of immune response; Antigen-antibody reaction; Immune tolerance; Hyper sensitivity; Graft versus host reaction ; Autoimmunity.

⏱ **Recombinant DNA Technology:Technology used to bring together genetic material from various sources to generate sequences which is not found in biological organisms**.It include topics- Restriction and modification enzymes; Vectors: plasmid, bacteriophage and other viral vectors, Ti plasmid, cosmids, yeast artificial chromosome; cDNA and genomic DNA library; Gene cloning ;Gene isolation; Expression of cloned gene; Transposons and gene targeting; DNA labeling; Polymerase chain reactions; DNA sequencing; Southern and northern blotting; In-situ hybridization; DNA fingerprinting; RAPD; RFLP; Gene transfer technologies; Gene therapy; Site-directed mutagenesis.

⏱ **Bioinformatics:Applying computer technology to regulate biological information.**It include topics- Major bioinformatics resources (EBI, NCBI, ExPASy); Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, sequence alignment, scoring matrices ,phylogeny); Genomics and Proteomics (Large scale genome sequencing strategies; Understanding DNA microarrays ,Comparative genomics,and protein arrays); Molecular modeling and simulations (basic concepts including concept of force fields).