SYLLABUS FOR PG –CET(BIOTECHNOLOGY)

VISVESWARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM, KARNATAKA

BIOTECHNOLOGY

Microbiology: Fundamentals of Microbiology; Classification of microorganisms; diversity of Microorganisms; 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; Microbial Mechanisms of Pathogenicity; Antimicrobial Drugs ; Microbes and human Welfare.

Biochemistry: Amino Acids, Peptides, Carbohydrates, Lipids: Structure, Function, Methods of Characterization, Separation Techniques, classification, Clinical Significance.: Nucleic Acids and Polynucleotides, Biomolecules and their conformation; Weak inter-molecular interactions in biomacromolecules; Chemical and functional nature of enzymes; Kinetics of single substrate and bisubstrate enzyme catalyzed reactions; Bioenergetics; Metabolism (Glycolysis, TCA and Oxidative phosphorylation); Membrane transport and pumps; Cell cycle and cell growth control; Cell signaling and signal transduction.

Molecular Biology and Genetics: Basics of Genomics & Proteomics; 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; 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 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; Aerobic and anaerobic biological processes for stabilization of solid / liquid wastes; Bioremediation.

Chemical/Bioprocess Engineering: Stoichiometry and chemical equations. Units, dimensions and conversions; Phase rule; gas-liquid and vapor-liquid systems; Material and energy balance for non-reacting and reacting systems; First and Second laws of thermodynamics; Laminar and turbulent flows in fluids; Velocity and pressure drop in pipes; Stoke's law and its applications; Fundamentals of Heat Transfer; Mass transfer coefficient ; Theories of mass transfer.

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 in bioreactors; Rheology of fermentation fluids; Scale-up concepts; Design of fermentation media; Various types of microbial and enzyme reactors; Instrumentation in bioreactors.

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 versus host reaction.

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; In-situ hybridization; RAPD; RFLP; Site-directed mutagenesis; Gene transfer technologies; Gene therapy; biosafety measures and regulations.

Bioinformatics: Major Bioinformatics resources (NCBI, EBI, ExPASy); Sequence and structure databases; Sequence analysis (biomolecular 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).

Agricultural Biotechnology: Micropropagation; Genetic engineering for qualitative and quantitative improvement of plant productivities; Protection of traditional knowledge, biodiversity and plant breeders' rights; Germ plasm conservation.

Food Biotechnology Determining Microorganisms and their Products in Foods; Food Spoilage : Spoilage of Fruits and Vegetables, Microbial Spoilage of Vegetables, Spoilage of Fruits, Spoilage of Fresh and Processed Meats, Poultry, and Seafood, Spoilage of Miscellaneous Foods; Food Preservation, Food Irradiation; Food Preservation; food and beverage fermentation, enzymes and food processing, sweeteners, food waste; Microbial food products, Unconventional food products, GMOs and GM Foods, rapid diagnostics, bioprocess technology for food applications , public acceptance and safety of new biotechnology foods.

Environmental Biotechnology
Introduction to ecology and ecosystem; Environmental pollution (water, soil and air), Waste water (sewage and industrial effluents) treatments ; Solid waste management: landfills, composting, recycling ;and processing of organic residues; biodegradation of xenobiotic compounds.

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: 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.

COMPUTER PROGRAMMING

Concept of algorithms, Flow charts; Structure of programs, objects, codes, compilers, concepts of finite storage, bits, bytes; Programming concepts using C; Concepts of variables, program statements & function calls; C data types, operators &expressions; Assignment statements, Concept of loops, Arrays.

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