

Annual Teaching Plan
Vivekanand College, Kolhapur
(An Empowered Autonomous Institute)
Department of Biotechnology (Entire)
Academic Year 2024-25

Name of the teacher: Mr. Ashutosh Laxman Upadhye

Programme Name: M.Sc.- I Biotechnology

Semester: Sem-I

Course Title: (DSE21MBT11) Environmental Biotechnology and Ecology

Month July -August 2024			Module/Unit: I & II	Sub-units planned
Lectures	Practical	Total		Air pollution: Primary and secondary pollutant, Global Warming,
20	04	24	Introduction to environment: pollution and its types; Toxicology: Definition, classification, and concept, Pesticide Toxicity –	Ozone hole, Water pollution: Introduction, causes, Hardness and its types BOD, COD, waste water treatment Soil pollution and its types and control, Environmental Classification (Organic and Inorganic), Mode of action of toxicants (Metals, organophosphates, carbamates and mutagens), Bioconcentration, Bioaccumulation, Biomagnifications.
Month Aug- Sept, 2024			Module/Unit: II & III	Sub-units planned
Lectures	Practical	Total	Bioremediation Techniques and Ecology Ecosystem Productivity Food chain Ecological pyramids- Energy flow in an ecosystem Biogeochemical cycle	Definition, Principle, In Situ and Exsitu Bioremediation, Bioremediation of waste waters (MSW, BSW, and ISW), Activated Sludge Process, Lagoons, Oxidation ponds, Trickling filter. Ecosystem- Concept, structure, function. Productivity- Kinds of productivity. Food chain- types of food chain, food web, concept of trophic level. Ecological pyramids- concepts and types. Energy flow in ecosystem –concept of energy, unit of energy, Biogeochemical cycle: Carbon cycle, Nitrogen cycle, Sulphur cycle, Phosphorus cycle Concept - Habitat and Niche
20	04	24		

Month Oct- Nov, 2024			Module/ Unit: IV	Sub-units planned
20	04	24	Population Ecology, Population growth and Evolution: - Hardy-Weinberg law and Equation.	Population Ecology- Introduction, population characteristics, Natality, Mortality, survivor ship curves, age structure, age pyramid. Population growth- Exponential and logistic, r and k strategists. Evolution: - Theories of evolution-Lamarckism, Darwinism, Modern synthetic theory and Mutational theory. Evidences of evolution and Adaptive radiation and Adaptive conversation. Concept of species and speciation. Hardy-Weinberg law and Equation.

Name and Signature of Teacher

(Mr A. L. Upadhye)

M. SC. CO-ORDINATOR
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DEPARTMENT OF BIOTECHNOLOGY
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(EMPOWERED & GENUINE)

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Academic Year 20_1-25

Name of the teacher: Mr. Ashutosh Laxman Upadhye

Programme Name: M.Sc.- I Biotechnology

Semester: Sem-II


Course Title: DSC21MBT21: Molecular Biology

Month Feb- March 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Experimental Evidence for DNA as a Genetic Material: Properties and Function of DNA: - Organization of genome: -	Experimental Evidences for DNA as a genetic material:- Griffith's Exp., Avery, Macleod, McCarty Exp., Blender Exp., RNA As a genetic material Gierer and Schram expt. Properties and Function of DNA:- Tm, Cot Curve, Purity of DNA, Acid-Base Nature, Buoyant Density Concept of Gene, Unit of Gene (Cistron, Recon, and Muton), Fine Structure of gene, One gene One Polypeptide Hypothesis, interrupted gene. Organization of genome:- Viral (Lambda, T4), Bacteria (E. coli), Eukaryote, Typical Structure of chromosome (Euchromatin & Heterochromatin), Packaging of DNA (Nucleosome, Solenoid Model).
20	06	24		
Month March- April, 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Nucleic Acid Biosynthesis :- DNA Replication Prokaryotic and eukaryotic replication DNA Damage:-	Nucleic Acid biosynthesis:- De novo synthesis of Purine and Pyrimidine ring, Salvage Pathway, Feedback inhibition. DNA Replication- Semi conservative model of replication (M.S Expt.). Direction of replication (Unidirectional and Bidirectional). Prokaryotic and eukaryotic replication- Enzymes involved in replication, initiation, elongation and termination. Rolling circle model and telomere replication. DNA Damage:- Mutation and its Types, Chemical damage of DNA by: Base Analogue, 5 Bromo uracil, 2Amino purine, Nitrous Acid.
20	06	24		

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Nitrosoguanidine, Methyl sulphate, EMS, Intercalating Agent (EtBr), DNA damage by UV Radiation
DNA Repair: - Photo reactivation
Repair of pyrimidine dimers, Direct repair, Excision repair (Nucleotide and Base), Mismatch repair, SOS repair, Recombination repair, Repair of double strand DNA break.


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Name of the teacher: Mr. Ashutosh Laxman Upadhye

Programme Name: M.Sc.- II Biotechnology

Semester: Sem-III

Course Title: DSC21MBT31 Advances in Gene Technology

Month July -August 2024			Module/Unit: I & II	Sub-units planned
Lectures	Practical	Total	Unit I: Enzymes and Vectors Used in Gene Cloning	Restriction enzymes and its types, T4 and <i>E coli</i> DNA polymerases, Reverse transcriptase, Terminal transferase, Alkaline phosphatase, Polynucleotide kinase, Ligase, DNases, RNases, and Topoisomerase. Plasmids Vectors: pUC18 and pBR322, Bacteriophages; Lambda phage, M13 phage, lambda Insertion and Replacement vectors, phagemid vectors, Cosmids: Artificial chromosome vectors (YACs; BACs); plant based vectors: Ti and Ri plasmid, yeast vectors, shuttle vectors. TA cloning Vectors. Probe Preparations and designing, methods of probe labeling, Radiolabelling and non-radio labelling, Application of probes in cloning.
20	04	24	Unit-II: Nucleic Acid Hybridization and Sequencing	
Month Aug- Sept, 2024			Module/Unit: II & III	Sub-units planned
Lectures	Practical	Total	Unit-II: Nucleic Acid Hybridization and Sequencing	Sequencing methods; enzymatic DNA sequencing; chemical sequencing of DNA; automated DNA sequencing. Principles of PCR: primer design; fidelity of thermo stable enzymes; DNA polymerases; types of PCR – multiplex, nested; reverse-transcription PCR, real time PCR, touchdown PCR, hot start PCR, colony PCR, asymmetric PCR, cloning of PCR products; proof reading enzymes; PCR based site specific mutagenesis; PCR in molecular diagnostics; viral and bacterial detection.
20	04	24	Unit-III Principle of PCR and its use in Genetic engineering	

Month Sept-Nov., 2024			Module/Unit: IV	Sub-units planned
20	04	24	Unit IV Applications of Genetic Engineering	Insertion of foreign DNA into host cells; transformation, electroporation, transfection; construction of libraries: cDNA and genomic DNA libraries, isolation of mRNA and total RNA, construction of microarrays – genomic arrays, cDNA arrays and oligo arrays; Gene silencing techniques; introduction to siRNA; siRNA technology; Micro RNA; construction of siRNA vectors; principle and application of gene silencing; gene knockouts and gene therapy; creation of transgenic plants;

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VINAYAK K. J. COLLEGE, KOLHAPUR
(W. CAMPUS)

Annual Teaching Plan
Vivekanand College, Keshavnagar
(An Empowered Autonomous Institute)
Department of Biotechnology (Entire)
Academic Year 2024-25

Name of the teacher: Mr. Ashutosh Laxman Upadhye

Programme Name: M.Sc.- II Biotechnology

Semester: Sem-IV

Course Title: DSE21MBT41: **Bioinformatics**

Month July -August 2024			Module/Unit: I & II	Sub-units planned
Lectures	Practical	Total	Unit I: Introduction to Bioinformatics	Introduction to Bioinformatics: Multidisciplinary approach of bioinformatics. Computers in Biology and Medicines. Internet, and related programs; Networking HTTP, HTML, WAN, LAN, MAN. Applications in communication.
20	04	24	Introduction to Databases Primary Genomic sequence Databases:	Introduction to Databases Primary Genomic sequence Databases: GenBank, EMBL, DDBJ; Primary Protein sequences databases: SWISS PROT, PIR, MIPS, TrEMBL, NRL3D Secondary sequences Databases: PROSITE, PROFILE, PRINTS, pfam, B:OCKS, Identity Literature Databases: Open access and open sources, PubMed, Biomed Central. Bioinformatics Resources: NCBI, EBI, ExPASy, RCSB. Structural Databases related to proteins (PDB, , MMDB, CATH, SCOP)
Month Aug- Sept, 2024			Module/Unit: II & III	Sub-units planned
Lectures	Practical	Total	Overview of Available Bioinformatics: Human Genome Project (HGP) Eukaryotic genomes with special reference to model organisms: Unit-III: Sequence Alignment	Overview of Available Bioinformatics: Resources on the Web, Protein and Genome, Sequence File Formats FASTA, GenPep, FASTQ and Structured File Formats. Human Genome Project (HGP), Goal and applications, final draft of HGP (complete information resources covered). Findings of Human Genome projects. Advancement due to Human Genome Project. Eukaryotic genomes with special reference to model organisms: Yeast (Eukaryotes), <i>Drosophila</i> (FlyBase), <i>C elegans</i> (WormBase), Mouse, Human (mammals), plants – <i>Arabidopsis thaliana</i> . Sequence Alignment: Pair wise sequence alignment, Multiple sequence alignment, Local and Global sequence alignment.
20	04	24		

Month Sept-Nov., 2024			Module/Unit: III & IV	Sub-units planned
20	4	24	Unit-III: Phylogenetic Analysis	Introduction: Definition of phylogenetic tree, nodes, internodes, root, tree, styles; cladogram, phenogram, curvogram. Methods of phylogenetic tree construction. Steps involved in constructing a phylogenetic tree: Phylogenetic analysis tools include Clustal W.
			Unit IV: Drug Designing	Structure-based drug designing Introduction to Structure-based Drug Designing Approaches: Target Identification and Validation, Homology Modeling and Protein Folding, Receptor Mapping, Active Site Analysis, and Pharmacophore Mapping. Ligand-based drug designing and docking Introduction, Ligand-based drug designing approaches: Lead Designing, combinatorial chemistry, High Throughput Screening (HTS), QSAR, Database generation and Chemical libraries, ADME property.

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Name of the teacher: Dr. Mahesh P. Mane

Programme Name: M.Sc.- II Biotechnology

Semester: Sem-IV

Course Title: DSE21MBT41: Animal Biotechnology

Month July -August 2024			Module/Unit: I & II	Sub-units planned
Lectures	Practical	Total	Introduction to animal tissue culture Major equipment's required Establishment of primary cell culture	Origin of concept of tissue culture, Cell types and cell lines, Differentiation of stem cells, Natural and Chemically defined mouse splenocyte culture Handling mammalian cell lines- thawing, culture maintenance and cryopreservation, Cell counting
20	04	24		
Month Aug- Sept, 2024			Module/Unit: II & III	Sub-units planned
Lectures	Practical	Total	Cell viability and proliferation assays Generation of chimeric, and knockout mice and their characterization. Gene editing	Trypan blue exclusion test, MTT assay, Propidium Iodide staining, CFSC labeling Cell sorting techniques- Ex-vivo expansion of hematopoietic stem cells Gene silencing- CRISPR associated protein-9 nuclease (cas9) technology
20	04	24		
Month Sept-Nov., 2024			Module/Unit: III & IV	Sub-units planned
Lectures	Practical	Total	Livestock improvement Applications of cell culture in veterinary Applications of Stem cell therapies Applications of stem cells in tissue repair and regeneration	Modern categories of vaccines Commercial preparation of vaccines Tissue systems failures- diabetes, cardiomyopathy, kidney failure, lymphoma and leukemic malignancies, Biomaterials, nanomaterial, biofabrication, 3D bioprinting
20	04	24		


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Name of the teacher: Dr. Mahesh P. Mane


Programme Name: M.Sc.- II Biotechnology

Semester: Sem-III

Course Title: DSC21MBT31: Plant Biotechnology

Month July -August 2024			Module/Unit: I & II	Sub-units planned
Lectures	Practical	Total	Plant Protection	Diseases of field, classification of plant diseases, Principles of plant diseases control, Integrated pest management concept and components
20	02	22	Secondary metabolites	Concept of secondary metabolites, Applications, <i>In vitro</i> production of sec. metabolites, Influence of culture conditions on accumulation of sec. metabolites
Month Aug- Sept, 2024			Module/Unit: II & III	Sub-units planned
Lectures	Practical	Total	Secondary metabolites	Immobilization of cells, Biotic and abiotic elicitation, Isolation, and purification of sec. metabolites.
20	02	22	Transgenic techniques in plant biotechnology	Introduction of foreign gene, Tumor formation, hairy root culture, DNA transfer, marker gene
Month Sept-Nov., 2024			Module/Unit: III & IV	Sub-units planned
20	04	24	Transgenic techniques in plant biotechnology	Vector less or direct DNA transfer methods, Applications of transformation for productivity and performance
			Concept of Plant tissue culture	Principle and working principle of instruments, different types of medias Organ culture, micropropagation and callus culture


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Name of the teacher: Dr. Mahesh P. Mane

Programme Name: M.Sc.- I Biotechnology

Semester: Sem-II

Course Title: DSC21MBT21: Molecular Biology

Month Feb- March 2025			Module/Unit: III	Sub-units planned
Lect ures	Practical	Total	Transcription in prokaryote and Eukaryote	Mechanism of transcription-Enzyme involved, initiation, elongation, and termination., Properties of genetic code. Assignment of codons with Unknown sequences a) Polyuridylic b) Acid Copolymers method. Assignment of codons with known sequences a) Binding technique b) Repetitive seq. technique.
15	-	15	Genetic Code	
Month March- April, 2025			Module/Unit: IV	Sub-units planned
Lect ures	Practical	Total	Translation in prokaryote and Eukaryote	Structure and role of ribosome in translation, Amino acid t-RNA complex formation, Initiation, Elongation, termination a) Lac operon b) Tryptophan operon c) Arabinose operon Regulation of gene expression at transcriptional and translation level.
15	-	15	Regulation of gene expression in prokaryote and eukaryote	


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Name of the teacher: Dr. Mahesh P. Mane

Programme Name: M.Sc.- I Biotechnology

Semester: Sem-I

Course Title: RMD14CHE11: Research Methodology in Biotechnology

Month July -August 2024			Module/Unit: I & II	Sub-units planned
Lectures	Practical	Total	Fundamentals of Research Methodology	Meaning, Objective, Motivation and Types of Research, Approach Literature Survey, Source of information, Review
20	04	24	Interpretation and Report writing	
Month Aug- Sept, 2024			Module/Unit: II & III	Sub-units planned
Lectures	Practical	Total	Interpretation and Report Writing	Meaning of Interpretation, Why Interpretation, Technique of interpretation, Precaution in Interpretation. Ultraviolet-visible absorption spectroscopy Fluorescence spectrophotometry
20	04	24	Research Methodology in Biotechnology	
Month Oct- Nov, 2024			Module/Unit: III & IV	Sub-units planned
Lectures	Practical	Total	Electrophoretic techniques Radioisotope techniques:	General principles, support media, electrophoresis of proteins (SDS-PAGE, native gels, gradient gels. Nature of radioactivity, isotopes in biochemistry
20	04	24		

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