TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2023-24

Name of the Teacher:Dr. Poonam *Department: Biotechnology*

Subject/Course: PaperIX. Bioinformatics *Programme: B.Sc.BiotechIInd Year*

Semester: IV

Unit	*Name of Topic/Contents*	*Tentative Dates/Days*
1.	*History, scope and importance of bioinformatics. Introduction to Genomics – information flow in Biology, DNA sequence data,*	*February*
2.	*experimental approach to genome sequence data, genome information resources. Functional Proteomics – protein sequence and structural data, protein information resources and secondary data bases.*	*March*
3.	*Computational Genomics - Internet basics, biological data analysis and application, sequence data bases, NCBI model, File format. Sequence alignment and data base search – protein primary sequence analysis, algorithm*	*April*
4.	*BLAST, multiple sequence alignment. DATA base searching using BLAST and FASTA.*	*May*

Name of the Teacher:Dr. Poonam *Department: Biotechnology*

Subject/Course: Biotech Major B23-BTY-201 General Microbiology *Programme: B.Sc.Life Sciences Ist Year*

Semester: II

Unit	*Name of Topic/Contents*	*Tentative Dates/Days*
1.	*History and evolution of microbiology with special reference to the contribution of the scientists: A. V. Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner and Alexander Fleming. Introduction to classification of microorganisms: Microbial taxonomy, different criteria including molecular approaches, Microbial phylogeny and current classification of bacteria. Stains and staining procedures: Acidic, basic and neutral stains, Gram staining, Acid fast staining, Flagella staining, Endospore staining. Distribution characterization: Prokaryotic and Eukaryotic and cells, Morphology and cell structure of major groups of microorganisms eg. Bacteria, Algae, Fungi and Protozoa.*	*February*
2.	*Cultivation and Maintenance of microorganisms: Nutritional requirements of microorganisms. Methods of isolation, purification, and preservation of microorganisms. Microbial growth: Study of growth curve, generation time, quantitative measurement of growth and factors affecting growth of bacteria. Bacterial Reproduction: Transformation, Transduction and Conjugation. Endospores and sporulation in bacteria.*	*March*
3.	*Viruses: General characteristics of viruses, difference between virus and typical microbial cell, structure, different shapes and symmetries with one example of each type, classification of viruses on the basis of nucleic acids, phage and animal cell viruses, example of each and their importance. Brief idea of lytic cycle and lysogeny. Control of microorganisms: By physical and chemical antimicrobial agents including antibiotics and their mode of action.*	*April*
4.	*Food and Water Microbiology: Bacterial pollutants of water, coliforms and non coliforms. Sewage composition and its disposal. Microbial spoilage of foods. Major food born infections and intoxications. Microbiology of fermented Foods. Microbial ecology: Microenvironment & Niche. Soil microbiology: Types & functions of microorganisms in soil*	*May*

Name of the Teacher:Dr. Poonam *Department: Biotechnology*

Subject/Course: Biotech Minor B23-BTY-203 Introduction of Biological Chemistry *Programme: B.Sc.Life Sciences Ist Year*

Semester: II

Unit	*Name of Topic/Contents*	*Tentative Dates/Days*
1.	*Basic constituents of matter elements, atoms, isotopes, atomic weights, atomic numbers, basics of mass spectrometry, molecules, Avogadro number, Molarity, Molality, Normality, gas constant, molecular weights, structural and molecular formulae, ions and polyatomic ions.*	*February*
2.	*Chemical reactions, reaction stoichiometry, rates of reaction, rate constants, order of reactions, Arrhenious equation, Maxwell Boltzmann distributions, rate-determining steps, catalysis, free-energy, entropy and enthalpy changes during reactions; kinetic versus thermodynamic controls of a reaction, reaction equilibrium (equilibrium constant).*	*March*
3.	*Light and matter interactions (optical spectroscopy, 3 fluorescence, bioluminescence); Chemical bonds (ionic, covalent, Van der Walls forces); States of matter vapor pressure, surface tension, boiling and melting points, solubility, capillary action, suspensions, colloids and solutions; Acids, Bases and pH Arrhenious theory, Ionic product of water, weak acids and bases, conjugate acid-base pairs, buffers.*	*April*
4.	*Types of organic reactions (Substitution, Addition, Elimination, Rearrangement etc.). Concept of isomerism: Types of isomerism, Optical isomerism, elements of symmetry, molecular chirality, enantiomers, chiral and achiral molecules. Geometric isomerism: Configuration of geometric isomers. Cis-Trans nomenclature. Redox reactions and electrochemistry-oxidation-reduction reactions.*	*May*

Name of the Teacher:Dr. Virender Kumar *Department: Biotechnology*

Subject/Course: Paper VIII. Recombinant DNA Technology *Programme: B.Sc Biotech IInd Year*

Semester: IV

Unit	*Name of Topic/Contents*	*Tentative Dates/Days*
1.	*Recombinant DNA Technology and Genetic Engineering: Introduction, history, scope and applications. Tools of Recombinant DNA technology: Steps in gene cloning. Gene cloning tools - Restriction enzymes- class I, II and class III restriction enzymes, their features. Ligases, polymerases, alkaline phosphatases, kinases, transferases and other DNA engineering enzymes. Gene Cloning Vectors: Introduction, nomenclature of vectors, properties of a suitable vector. Plasmid vectors, bacteriophage, cosmids and phagemids. Properties of host. M13 vectors. Expression vectors, shuttle vectors. Vectors for cloning in eukaryotic cells, YACs and BACs. In vitro construction of r-DNA molecules: Isolation of gene of interest and vector DNA, cohesive and blunt ends, modification of cut ends, linkers and adaptors. Integration of DNA inserts into the vectors.*	*February*
2.	*Transformation: Techniques of introducing r-DNA into the desired host, competent cells, electroporation and microinjection. Screening and selection of transformants and their characterization, selection of clone having the specific DNA insert - immunological screening and colony hybridization. Marker genes- selectable and scorable markers. Gene Libraries: Construction of Genomic and cDNA library, advantages and limitations, screening of gene libraries.* *DNA amplification through PCR: Basic features and applications of PCR, types and modifications. Site directed mutagenesis. DNA sequencing techniques: Maxam – Gilbert's method, Sanger's dideoxy chain termination method, Automated DNA sequencing. Genome Mapping: Concept and applications.*	*March*
3.	*Restriction enzyme digestion and restriction mapping. Southern and Northern analysis. DNA finger printing. PAGE, Western blotting, dot blots and slot blots. RFLP, RAPD (brief only), microarrays. Gene expression in prokaryotes: expression*	*April*

	cassette. Promoters- tissue specific promoters, wound inducible promoters, strong and regulated promoters. Increasing protein yield-factors affecting level of recombinant protein production. Production of recombinant proteins in E. coli, translational and transcriptional fusion- advantages and disadvantages. Applications of Recombinant DNA technology: Production of recombinant proteins of pharmaceutical importance- insulin, human growth hormone, recombinant vaccines (hepatitis B) etc. Transgenic plants and animals.	

Name of the Teacher:Dr. Virender Kumar *Department: Biotechnology*

Subject/Course: PaperIX. Bioinformatics *Programme: B.Sc Biotech IInd Year*

Semester: IV

Unit	*Name of Topic/Contents*	*Tentative Dates/Days*
1.	*Structural data bases – Small molecules data bases, protein information resources, protein data bank.*	*May*

Name of the Teacher:Dr. Virender Kumar *Department: Biotechnology*

Subject/Course: Paper XIII. Microbial Biotechnology *Programme: B.Sc Biotech IIIrd Year*

Semester: VI

Unit	*Name of Topic/Contents*	*Tentative Dates/Days*
1.	*Microbial Biotechnology: Historical landmarks, General concept. Screening and Isolation of Micro organisms: Industrially important microbes, their screening and isolation, enrichment culture. Strain improvement- bacterial genetics, mutant selection, recombination, recombinant DNA technology. Strain preservation and maintenance. Nutrition and cultivation of microorganisms: Basic nutrition and metabolism, Natural and Synthetic media, Sterilization techniques, Microbial growth kinetics. Fermentation types – Continuous, Batch fed culture, Solid state and Submerged. Quantification of growth, thermodynamics of growth, effect of different factors on growth.*	*February*
2.	*Fermentation concepts and types. Microbial Fermenters/Bioreactors: Basic design of fermenters. Physco-chemical standards used in bioreactors (agitation, aeration, ph, temp., dissolved oxygen etc.). Types of fermentersstirred tank, bubble column, airlift etc. Process Development and Downstream Processing: Shake flask fermentation, scale up of the process. Downstream processing – Separation of particles, disintegration of cells, extraction, concentration, purification and drying of the products.*	*March*
3.	*Microbial Products: a brief discussion about production of certain industrial products such as – Alcohol, Alcoholic beverage (Beer), Organic acids (citric acid), Antibiotics (penicillin), Amino acids (glutamic acid0, Vitamin (B12), enzymes (protease, alpha-amylase) and a brief account of Steroid Biotransformation. Microbial Foods: Single Cell Proteins. Sewage waste water treatment technique and plants. Biodegradation of xenobiotic compounds.*	*April*
4.	*Microbial polysaccharides and polyesters; production of xanthan gum and polyhydroxyalkanoides (PHA). Bioconversions – Biomining and bioleaching. Biogas production. Microbial technology in agriculture- Bioinsecticides, bioherbicides, biocontrol agents for disease control, advantages over chemical methods. Biofertilizers. Genetically engineered microbes: concept and technique; use of GEM in Agriculture, Industry and Medicine.*	*May*