SEM I

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Introduction to Microbiology and Microbial Diversity	Semester I	Theory	Core T-1	4

Broad Topic	Lecture Number	Lecture Topic
History and development of Microbiology	Lecture 1	History and development of microbiology, Theory of Spontaneous generation, Germ theory of disease
	Lecture 2	Contributions of Leeuwenhoek, Koch, Pasteur, Jenner and Fleming etc.
	Lecture 3	An over view of the Scope of microbiology
Diversity of Microbial World	Lecture 4	Systems of Classification
	Lecture 5	Basic idea about Hackle and Whittaker's kingdom concept
	Lecture 6	Basic idea about domain concept of Carl Woose
	Lecture 7	General characteristics and representative members of different groups: Cellular microorganisms (Archaea, Bacteria, Algae, Fungi and Protozoa)
	Lecture 8	General characteristics and representative members of different groups: Acellular microorganisms (Viruses, Viroids, Prions)
Microscope	Lecture 9	Principle of Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope
	Lecture 10	Transmission Electron Microscope, Scanning Electron Microscope
Phycology	Lecture 11	General characteristics of algae
	Lecture 12	Vegetative, asexual and sexual reproduction
	Lecture 13	Group- Chlorophyta,
	Lecture 14	Group-, Xanthophyta
	Lecture 15	Group- Cyanophyta
	Lecture 16	Applications of algae in agriculture, industry, environment and food
Mycology	Lecture 17	General characteristics of fungi
	Lecture 18	Asexual & sexual reproduction
	Lecture 19	Heterokaryosis, heterothallism and parasexual mechanism
	Lecture 20	Economic importance of Fungi
Protozoa	Lecture 21	General characteristics of Protozoa
	Lecture 22	*Amoeba, Paramecium, Plasmodium*
	Lecture 23	Economic importance of protozoa

Course / Paper Name	Class	Course Type	Course Code	Credit
Introduction to Microbiology & Microbial Diversity	Semester I	Practical	Core P-1	2

Exp. Number	Class Plan	No. of Classes allotted	Experiment Name
Exp. 1	Week 1	1	Microbiology Laboratory Management and Biosafety
Exp. 2	Week 2	2	To study the principle and applications of important instruments (autoclave, incubator, hot air oven, centrifuge, light microscope, pH meter) used in the microbiology laboratory
Exp. 3	Week 3	2	Preparation of culture media (Nutrient Broth an Nutrient Agar) for bacterial cultivation
Exp. 4	Week 4	1	Sterilization of medium using Autoclave and assessment for sterility
Exp. 5	Week 5	1	Sterilization of glassware using Hot Air Oven
Exp. 6	Week 6	1	Sterilization of heat sensitive material by filtration
Exp. 7	Week 7	2	Isolation and enumeration of bacteria from air
Exp. 8	Week 8	1	Study of *Rhizopus, Penicillium, Aspergillus* using permanent mounts
Exp. 9	Week 9	1	Study of *Spirogyra, Chlamydomonas* using permanent Mounts
Exp. 10	Week 10	1	Study of *Paramecium, Plasmodium* using permanent mounts

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Bacteriology	Semester 1	Theory	Core T-2	4

Broad Topic	Lecture Number	Lecture Topic
Cell organization	Lecture 1	Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili.
	Lecture 2	Cellwall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaebacterial cell wall
	Lecture 3	Gram and acid fast staining mechanisms, lipopolysaccharide (LPS), sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall.
	Lecture 4	Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes.
	Lecture 5	Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids Endospore: Structure, formation, stages of sporulation.
Bacteriological techniques	Lecture 6	Pure culture isolation: Streaking, serial dilution and plating methods
	Lecture 7	Cultivation, maintenance and preservation/stocking of pure cultures
	Lecture 8	Cultivation of anaerobic bacteria, and accessing non-culturable bacteria.
Growth and Nutrition	Lecture 9	Nutritional requirements in bacteria and nutritional categories
	Lecture 10	Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media
	Lecture 11	Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation
	Lecture 12	Chemical methods of microbial control: disinfectants, types and mode of action.

Reproduction in Bacteria	Lecture 13	Asexual methods of reproduction
	Lecture 14	Logarithmic representation of bacterial populations
	Lecture 15	Phases of growth, calculation of generation time and specific growth rate.
Bacterial Systematics	Lecture 16	Aim and principles of classification, systematics and taxonomy
	Lecture 17	Concept of species, taxa, strain; Characters used in bacterial systematic
	Lecture 18	Differences between eubacteria and archaebacteria
Important archaeal and eubacterial groups	Lecture 19	Archaebacteria: General characteristics, suitable example and economic importance.
	Lecture 20	Eubacteria: General characteristics with suitable example.
	Lecture 21	Gram Negative: Non proteobacteria, Alpha proteobacteria, Beta proteobacteria, Delta proteobacteria, Epsilon proteobacteria, Zeta proteobacteria.
	Lecture 22	Gram Positive: Low G+ C (Firmicutes), High G+C (Actinobacteria). Cyanobacteria: An Introduction

Course / Paper Name	**Class**	**Course Type**	**Course Code**	**Credit**
Bacteriology	Semester I	Practical	Core P-2	2

Exp. Number	**Class Plan**	**No. of Classes allotted**	**Experiment Name**
Exp. 1	Week 1	2	Preparation of different media: synthetic media BG-11, Complex media-Nutrient agar, McConkey agar, EMB agar.
Exp. 2	Week 2	1	Simple staining
Exp. 3	Week 3	1	Negative staining
Exp. 4	Week 4	1	Gram's staining
Exp. 5	Week 5	1	Acid fast staining-permanent slide only.
Exp. 6	Week 6	1	Endospore staining.
Exp. 7	Week 7	2	Isolation of pure cultures of bacteria by streaking method.
Exp. 8	Week 8	2	Preservation of bacterial cultures (slant / stab).
Exp. 9	Week 9	2	Estimation of CFU count by spread plate method/pour plate method.
Exp. 10	Week 10	1	Motility by hanging drop method.

SEM III

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Microbial Physiology And Metabolism	Semester III	Theory	Core T-5	4

Broad Topic	Lecture Number	Lecture Topic
Microbial Growth and Effect of Environment on Microbial Growth	Lecture 1	Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve
	Lecture 2	Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles)
	Lecture 3	Solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic.
	Lecture 4	Microbial growth in response to nutrition and energy (Definition with example only) – Autotroph/Phototroph, heterotroph, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph
Nutrient uptake and Transport	Lecture 5	Passive and facilitated diffusion
	Lecture 6	Primary and secondary active transport, concept of uniport, symport and antiport
	Lecture 7	Group translocation. Iron uptake.
Chemoheterotrophic Metabolism - Aerobic Respiration	Lecture 8	Concept of aerobic respiration. Sugar degradation pathways i.e. EMP, ED
	Lecture 9	Pentose phosphate pathway. TCA cycle
	Lecture 10	Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, Electron transport phosphorylation.

Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation	Lecture 11	Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction)
	Lecture 12	Fermentation - Alcohol fermentation and Pasteur effect
	Lecture 13	Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways
Chemolithotrophic and Phototrophic Metabolism	Lecture 14	Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction)
	Lecture 15	Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis
	Lecture 16	Photosynthesis in green bacteria, purple bacteria and cyanobacteria
Nitrogen Metabolism - an overview	Lecture 17	Introduction to biological nitrogen fixation
	Lecture 18	Ammonia assimilation. Assimilatory nitrate reduction
	Lecture 19	dissimilatory nitrate reduction, denitrification

Course / Paper Name	**Class**	**Course Type**	**Course Code**	**Credit**
Microbial Physiology And Metabolism	Semester III	Practical	Core P-5	2

Exp. Number	**Class Plan**	**No. of Classes allotted**	**Experiment Name**
Exp. 1	Week 1	2	Study and plot the growth curve of *E. coli* by turbidometric and standard plate count methods
Exp.2	Week 2	1	Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data
Exp. 3	Week 3	2	Effect of temperature on growth of *E. coli*
Exp. 4	Week 4	2	Effect of pH on growth of *E. coli*
Exp. 5	Week 5	2	Effect of carbon and nitrogen sources on growth of *E.coli*
Exp.6	Week 8	2	Effect of salt on growth of *E. coli*
Exp. 7	Week 9	1	Demonstration of alcoholic fermentation
Exp. 8	Week 10	2	Demonstration of the thermal death time and decimal reduction time of *E. coli.*

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Cell Biology	Semester III	Theory	Core T-6	4

Broad Topic	Lecture Number	Lecture Topic
Structure and organization of Cell	Lecture 1	Cell Organization – Eukaryotic and prokaryotic
	Lecture 2	Plasma membrane: Structure and transport of small molecules
	Lecture 3	Cell Wall: Eukaryotic cell wall, Extra cellular matrix and cell matrix interactions
	Lecture 4	Mitochondria, chloroplasts and peroxisomes
	Lecture 5	Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane
Nucleus	Lecture 6	Nuclear envelope, nuclear pore complex and nuclear lamina
	Lecture 7	Chromatin – Molecular organization Nucleolus
Protein Sorting and Transport	Lecture 8	Ribosomes, Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER
	Lecture 9	Protein folding, processing and quality control in ER, Smooth ER and lipid synthesis, Export of proteins and lipids from ER
	Lecture 10	Golgi Apparatus – Organization, protein glycosylation, protein sorting and export from Golgi Apparatus, Lysosomes
Cell Signalling	Lecture 11	Modes of Cell to Cell Signalling, Signalling molecules and their receptors
	Lecture 13	Function of cell surface receptors
	Lecture 14	Pathways of intra-cellular receptors – Cyclic AMP pathway, cyclic GMP and MAP Kinase pathway
Cell Cycle, Cell Death and Cell Renewal	Lecture 15	Regulation of Programmed cell death
	Lecture 16	Interferon and their mode of action
	Lecture 17	Development of cancer, causes and types, p53 gene product
	Lecture 18	Stem cells, Embryonic stem cell, induced pleuripotent stem cells

Course / Paper Name	Class	Course Type	Course Code	Credit
Cell Biology	Semester III	Practical	Core P-6	2

Exp. Number	Class Plan	No. of Classes allotted	Experiment Name
Exp. 1	Week 1	1	Study a representative plant cell by microscopy
Exp. 1	Week 2	1	Study a representative animal cell by microscopy
Exp. 2	Week 3	1	Study of the structure of cell organelles through electron micrographs
Exp. 3	Week 4	1	Cytochemical staining of DNA – Feulgen
Exp. 4	Week 5	1	Identification and study of cancer cells by photomicrographs
Exp.5	Week 6	1	Study of different stages of Mitosis
Exp. 6	Week 7	1	Study of different stages of Meiosis

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Molecular Biology	Semester III	Theory	Core T-7	4

Broad Topic	Lecture Number	Lecture Topic
Structures of DNA and RNA / Genetic Material	Lecture 1	DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA
	Lecture 2	Types of genetic material, denaturation and renaturation, cot curves. DNA topology – linking number, topoisomerases
	Lecture 3	Organization of Genome: Prokaryotes (*E. coli*), Viruses (DNA virus-SV40, RNA virus-HIV)
	Lecture 4	Eukaryotes (S.cerevisiae). RNA Structure
	Lecture 5	Organelle DNA – mitochondria and chloroplast DNA
Replication of DNA (Prokaryotes and Eukaryotes)	Lecture 6	Bidirectional and unidirectional replication, semi- conservative, semi- discontinuous replication
	Lecture 7	Mechanism of DNA replication: Enzymes and proteins involved in DNA replication –DNA polymerases, DNA ligase, primase, telomerase
	Lecture 8	Various models of DNA replication including rolling circle, Θ (theta) mode of replication
	Lecture 9	Mismatch and excision repair
Transcription in Prokaryotes and Eukaryotes	Lecture 10	Transcription: Definition, difference from replication, promoter - concept and strength of promoter
	Lecture 11	RNA Polymerase and the Prokaryotic transcription unit
	Lecture 12	Transcription in Eukaryotes: RNA polymerases, general Transcription factors
Post-Transcriptional Processing	Lecture 13	Split genes, concept of introns and exons
	Lecture 14	RNA splicing, spliceosome machinery, concept of alternative splicing,
	Lecture 15	Polyadenylation and capping, Processing of rRNA
	Lecture 16	RNA interference: si RNA, its significance in brief
	Lecture 17	Translational machinery, Charging of tRNA,

Translation (Prokaryotes and Eukaryotes)		aminoacyl tRNA synthetases
	Lecture 18	Mechanisms of initiation, elongation and termination of polypeptides in prokaryotes
	Lecture 19	Mechanisms of initiation, elongation and termination of polypeptides in eukaryotes
	Lecture 20	Inhibitors of protein synthesis in prokaryotes and eukaryote.
Regulation of gene Expression in Prokaryotes and Eukaryotes	Lecture 21	Principles of transcriptional regulation
	Lecture 22	regulation at initiation in lac operon
	Lecture 23	regulation at initiation in trp operons
	Lecture 24	Changes in Chromatin Structure -DNA methylation and Histone Acetylation mechanisms

Course / Paper Name	**Class**	**Course Type**	**Course Code**	**Credit**
Molecular Biology	Semester III	Practical	Core P-7	2

Exp. Number	**Class Plan**	**No. of Classes allotted**	**Experiment Name**
Exp. 1	Week 1	1	Study of different types of DNA and RNA using micrographs and model / schematic representations
Exp. 2	Week 2	1	Study of semi-conservative replication of DNA through micrographs / schematic representations
Exp. 3	Week 3	1	Isolation of genomic DNA from E. coli
Exp. 4	Week 4	1	Estimation of salmon sperm / calf thymus DNA using colorimeter (diphenylamine reagent) or UV spectrophotometer (A260 measurement)
Exp.5	Week 5	1	Estimation of RNA using colorimeter (orcinol reagent) or UV spectrophotometer (A 260measurement)
Exp.6	Week 6	1	Resolution and visualization of DNA by Agarose Gel Electrophoresis.
Exp. 7	Week 7	1	Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Microbiological Analysis of Air & Water	Semester III	Theory	SEC-1	4

Broad Topic	Lecture Number	Lecture Topic
Aero microbiology	Lecture 1	Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi, each from every category) and their impact on human health & environment
	Lecture 2	Significance of air borne microorganisms in food and pharma industries and operation theatres, allergens.
Air Sample Collection and Analysis	Lecture 3	Bioaerosol sampling, air samplers, methods of analysis, CFU
	Lecture 4	media for bacteria and fungi, Identification characteristics
Control Measures	Lecture 5	Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters
	Lecture 6	Inactivation mechanisms –desiccation, Incineration
Water Microbiology	Lecture 7	Water borne pathogens
	Lecture 8	water borne diseases
Microbiological Analysis of Water	Lecture 9	Mode of viral transmission
	Lecture 10	Sample Collection, Treatment and safety of drinking (potable) water
	Lecture 11	standard qualitative procedure: presumptive/MPN tests, confirmed and completed tests for faecal coliforms
	Lecture 12	Membrane filter technique and (c) Presence/absence tests
Control Measures	Lecture 13	Precipitation, , filtration, high temperature, UV light
	Lecture 14	Chemical disinfection

SEM V

BANKURA SAMMILANI COLLEGE
Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Industrial Microbiology	Semester V	Theory	Core T-11	4

Broad Topic	Lecture Number	Lecture Topic
Introduction to industrial microbiology	Lecture 1	Brief history of industrial microbiology
	Lecture 2	Developments in industrial microbiology
Isolation of industrially important microbial strains and fermentation media	Lecture 3	Sources of industrially important microbes and methods for their isolation, preservation and maintenance of industrial strains, strain improvement
	Lecture 4	Crude and synthetic media; molasses, corn steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates
Types of fermentation processes, bio-reactors and measurement of fermentation parameters	Lecture 5	Types of fermentation processes - Solid-state and liquid-state (stationary and submerged)
	Lecture 6	Batch, fed-batch (eg. baker's yeast) and continuous fermentations
	Lecture 7	Components of a typical bio-reactor, Types of Bioreactors-Laboratory, pilot- scale and production fermenters
	Lecture 8	Stirred tank and air-lift fermenters
	Lecture 9	Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration.
Down-stream processing	Lecture 10	Cell disruption, filtration, centrifugation
	Lecture 11	Solvent extraction, precipitation
	Lecture 12	Lyophilisation and spray drying.
Microbial production of industrial products	Lecture 13	Production of Citric acid, & glutamic acid,
	Lecture 14	Production of ethanol, penicillin & Vitamin B12
	Lecture 15	Production of Enzymes (amylase, protease)
	Lecture 16	Production of Wine & beer
Enzyme immobilization	Lecture 17	Methods of immobilization, advantages and applications of immobilization
	Lecture 18	scale applications of immobilized enzymes (glucose isomerase)

Course / Paper Name	Class	Course Type	Course Code	Credit
Industrial Microbiology	Semester V	Practical	Core P-11	2

Exp. Number	Class Plan	No. of Classes allotted	Experiment Name
Exp. 1	Week 1	1	Study different parts of fermenter
Exp. 2	Week 2	1	Microbial fermentations for the production and estimation (qualitative and quantitative) of: Enzymes: Amylase
Exp. 2	Week 3	1	Microbial fermentations for the production and estimation (qualitative and quantitative) of: Enzymes: Protease
Exp. 2	Week 4	1	Microbial fermentations for the production and estimation (qualitative and quantitative) of: Amino acid: Glutamic acid
Exp. 2	Week 5	1	Microbial fermentations for the production and estimation (qualitative and quantitative) of: Organic acid: Citric acid
Exp.2	Week 6	1	Microbial fermentations for the production and estimation (qualitative and quantitative) of: Alcohol: Ethanol
Exp.3	Between Week 15 to Week 20		A visit to any educational institute/industry.

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Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Immunology	Semester V	Theory	Core T-12	4

Broad Topic	Lecture Number	Lecture Topic
Introduction	Lecture 1	Fundamental concept of Innate and Adaptive immunity
	Lecture 2	Contributions of following scientists to the development of field of immunology - Edward Jenner, Louis Pasteur, Karl Landsteiner, Robert Koch,
	Lecture 3	Contributions of following scientists to the development of field of immunology - Paul Ehrlich, Elie Metchnikoff, Peter Medawar, MacFarlane Burnet and Rodney Porter
Immune Cells and Organs	Lecture 4	Structure, Functions and Properties of: Immune Cells –B cell, T cell
	Lecture 5	NK cell, Macrophage, Dendritic cell, Stem cell
	Lecture 6	Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen
Antigens	Lecture 7	Characteristics of an antigen; T-dependent and T-independent antigens
	Lecture 8	Concept of Epitopes, Adjuvants, Haptens, Carrier
Antibodies	Lecture 9	Structure, and Functions of antibodies
	Lecture 10	Types of antibodies
	Lecture 11	Production and Clinical uses of Monoclonal antibodies
Major Histocompatibility Complex	Lecture 12	Organization of MHC locus (Mice & Human)
	Lecture 13	Structure and Functions of MHC I & II molecules
Complement System	Lecture 14	Components of the Complement system
	Lecture 15	Complement Activation pathways (Classical, Alternative and Lectin pathways)
	Lecture 16	Biological consequences of complement Activation
Generation of	Lecture 17	Generation of Humoral and Cell Mediated

Immune Response		Immune Response
	Lecture 18	Antibody dependent cellular cytotoxicity (ADCC)
Types of Immunization	Lecture 19	Characteristics and functions of Active and Passive Immunization
Immunological Techniques	Lecture 20	Principles of Precipitation, Agglutination
	Lecture 21	Immunodiffusion, Immunoelectrophoresis, ELISA,

Course / Paper Name	**Class**	**Course Type**	**Course Code**	**Credit**
Immunology	Semester V	Practical	Core P-12	2

Exp. Number	**Class Plan**	**No. of Classes allotted**	**Experiment Name**
Exp. 1	Week 1	1	Identification of human blood groups
Exp. 2	Week 2	1	Perform Total Leukocyte Count of the given blood sample
Exp. 3	Week 3	1	Separate serum from the blood sample (demonstration)
Exp. 4	Week 4	1	Demonstration of immunoelectrophoresis
Exp. 5	Week 5	1	Perform immunodiffusion by Ouchterlony method
Exp.6	Week 6	1	Perform DOT ELISA

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Department of Microbiology

Microbiology Hons. (CBCS)
Syllabi module for Courses with **Lectures**

2021-22

Course / Paper Name	Class	Course Type	Course Code	Credit
Bioinformatics	Semester V	Theory	DSE-1	4

Broad Topic	Lecture Number	Lecture Topic
Introduction to Computer Fundamentals	Lecture 1	RDBMS - Definition of relational database
	Lecture 2	Mode of data transfer (FTP, SFTP, SCP), advantage of encrypted data transfer
Introduction to Bioinformatics and Biological Databases	Lecture 3	Biological databases - nucleic acid, genome, protein sequence and structure, gene expression databases, Database of metabolic pathways
	Lecture 4	Mode of data storage - File formats - FASTA, Genbank and Uniprot
	Lecture 5	Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB
Sequence Alignments, Phylogeny and Phylogenetic trees	Lecture 6	Local and Global Sequence alignment, pairwise and multiple sequence alignment
	Lecture 7	Scoring an alignment, scoring matrices, PAM & BLOSUM series of matrices
	Lecture 8	Types of phylogenetic trees, Different approaches of phylogenetic tree construction - UPGMA, Neighbour joining
	Lecture 9	phylogenetic tree construction - Maximum Parsomony, Maximum likelihood
Genome organization and analysis	Lecture 10	Diversity of Genomes: Viral, prokaryotic & eukaryotic genomes
	Lecture 11	Genome, transcriptome, proteome,
	Lecture 13	2-D gel electrophoresis & MaldiToff spectroscopy
	Lecture 14	Major features of completed genomes: *E.coli, S.cerevisiae, Arabidopsis,* Human
Protein Structure Predictions	Lecture 15	Hierarchy of protein structure - primary, secondary and tertiary structures
	Lecture 16	Modelling Structural Classes, Motifs, Folds and Domains
	Lecture 17	Protein structure prediction in presence and absence of structure template
	Lecture 18	Energy minimizations and evaluation by Ramachandran plot
	Lecture 19	Protein structure and rational drug design

Course / Paper Name	Class	Course Type	Course Code	Credit
Bioinformatics	Semester V	Practical	DSE-1	2

Exp. Number	Class Plan	No. of Classes allotted	Experiment Name
Exp. 1	Week 1	1	Introduction to different operating systems - UNIX, LINUX and Windows
Exp. 2	Week 2	2	Introduction to bioinformatics databases (any three): NCBI/PDB/DDBJ, Uniprot, PDB
Exp. 3	Week 3	1	Sequence retrieval using BLAST
Exp. 4	Week 4	1	Sequence alignment & phylogenetic analysis using clustalW & phylip
Exp. 5	Week 5	1	Picking out a given gene from genomes using Genscan or other softwares (promoter region identification, repeat in genome, ORF prediction).
Exp.5	Week 6	1	Gene finding tools (Glimmer, GENSCAN), Primer designing, Genscan/Genetool
Exp. 6	Week 7	1	Protein structure prediction: primary structure analysis, secondary structure prediction using psipred,homology modeling using Swissmodel
Exp. 7	Week 8	1	Molecular visualization using jmol, Protein structure model evaluation (PROCHECK)
Exp.8	Week 9	2	Prediction of different features of a functional gene