

TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2025-26

Name of the Teacher: Dr. Poonam

Department: Biotechnology

Subject/Course: Major/ Cell Biology (B23-BTY-301)

Programme: B.Sc. Ist LS

Semester: 3rd

<i>Unit</i>	<i>Name of Topic/Contents</i>	<i>Tentative Dates/Days</i>
1	Basics of Cell Biology - Discovery of cell and Cell Theory; Comparison between plant and animal cells; Structure and function of Protoplasm, Cell wall, Plasma membrane, Modification of plasma membrane and intracellular junctions, Cytoskeleton, Chloroplast, ER, Golgi complex. Mitochondria,	August
2	Structure and function of Lysosome, endosome and microbodies, Ribosome, Centriole, Nucleus, Chromosomes, Chemical components of a cell, Catalysis and use of energy by cells. Biogenesis of Cellular organelles Biogenesis of mitochondria, chloroplast, ER, Golgi complex, Biosynthetic process in ER and Golgi apparatus, Protein synthesis and folding in the cytoplasm, Degradation of cellular components.	September
3	Structure and function of Prokaryotic cell and its components The Slime and the cell wall of bacteria containing peptidoglycan and related molecules; the outer membrane of Gram-negative bacteria, the cytoplasmic membrane. Water and ion transport, mesosomes, flagella, Pilus, fimbriae, ribosomes, carboxysomes, sulfur granules, glycogen, polyphosphate bodies, fat bodies, gas vesicles; endospores, exospores, cysts. Mycelia of fungi and Actinomycetes, Cytoskeleton filament, heterocysts and akinets of Cyanobacteria, Gliding and motility.	October
4	Membrane structure and transport - Models of membrane structure, Membrane lipids, proteins and carbohydrates; Solute transport by Simple diffusion, Facilitated diffusion and Active transport Cell cycle An overview of cell cycle, Components of cell cycle control system, Intracellular and Extra-cellular control of cell division, Programmed cell death (Apoptosis).	November

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TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2025-26

Name of the Teacher: Dr. Poonam

Department: Biotechnology

Subject/Course: MDC / Biology-III B23-BTY-303

Programme: B.Sc. Ist PS & BBA

Semester: Ist

<i>Unit</i>	<i>Name of Topic/Contents</i>	<i>Tentative Dates/Days</i>
1	Reproduction; Sexual Reproduction in Flowering Plants: Flower structure; development of male and female gametophytes; pollination types, agencies and examples; out breeding devices; pollen-pistil interaction; double fertilization; post fertilization events development of endosperm and embryo, development of seed and formation of fruit; special modes- apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation. Human Reproduction: Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).	August
2	Genetics and Evolution: Heredity and variation: Mendelian inheritance; deviations from Mendelism incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination lac in humans, birds and honey bee; linkage and crossing over; sex linked inheritance haemophilia, colour blindness; Mendelian disorders in humans thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes. Molecular Basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central Dogma; transcription, genetic code, translation; gene expression and regulation operon; Genome, Human and rice genome projects; DNA fingerprinting. Evolution: Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy Weinberg's principle; adaptive radiation; human evolution.	September
3	Biology and Human Welfare: Human Health and Diseases: Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology -vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse. Microbes in Human Welfare: Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use.	October
4	Ecology and Environment: Organisms and Populations: Population interactions - mutualism, -competition, predation, parasitism; population attributes growth, birth rate	November

	<p>and death rate, age distribution, Organism and its Environment, Major Abiotic Factors, Responses to Abiotic Factors, Adaptations), Ecosystem: Ecosystems: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy (Topics excluded: Ecological Succession and Nutrient Cycles), Biodiversity Conservation: Biodiversity-Concept, and its patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites</p>	
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TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2025-26

Name of the Teacher: Dr. Virender Kumar

Department: Biotechnology

Subject/Course: Major / Introduction of Biotechnology (B23-BTY-101) Programme: B.Sc. LS

Semester: Ist

<i>Unit</i>	<i>Name of Topic/Contents</i>	<i>Tentative Dates/Days</i>
1	Introduction to biotechnology an interdisciplinary pursuit; Main areas of application of biotechnology, Biotechnology research in India and biotechnology in context of developing world; Public perception of biotechnological products; Brief account of safety guidelines, risk assessment and ethics in biotechnology; Very brief account of intellectual property rights; Substrates (raw materials) and the future of biotechnology. In brief scope and techniques of preservation. Introduction of fermentation technology.	August
2	Introduction of animal tissue culture (brief of history, culture media, substrate surfaces, culture procedures, primary cultures, cell lines, organ culture and tissue engineering etc.). Introduction of plant tissue culture (in brief history, culture media, explants, totipotency, dedifferentiation and types of cell & tissue culture etc.). Scope and applications of animal biotechnology and plant biotechnology. Brief account of immunotechnology: immune system (immune cells, types of immunity and general structure of immunoglobulins), hybridoma technology and monoclonal antibodies. In vitro fertilization and embryo transfer technology in brief.	September
3	Genetics and Biotechnology: Introduction of genetic engineering, gene and genomes, proteins and proteome, history of genetic manipulations, DNA fingerprinting and forensic analysis. Industrial genetics, Potential laboratory biohazards of genetic engineering. Introduction to molecular markers and genetic mapping, Introduction of enzyme technology: nature of enzymes, application of enzymes and immobilized enzymes.	October
4	Environmental Biotechnology: An overview, scope and market of biological control of environment. Brief account on bioremediation and waste treatment biotechnology, microbial insecticides, biofertilizers, microbes in oil recovery and bioleaching. Application of biotechnology in medicine (pharmaceutical industry, vaccines, antibiotics etc.), food industry, biofuels and chemical industry.	November

TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2025-26

Name of the Teacher: Dr. Virender Kumar

Department: Biotechnology

*Subject/Course: Minor / Laboratory Techniques and Practices (B23-BTY-103) Programme:
B.Sc. LS*

Semester: Ist

<i>Unit</i>	<i>Name of Topic/Contents</i>	<i>Tentative Dates/Days</i>
1	Lab rules and safety measures to be taken in Biotechnology Lab., Commonly used equipments for Biotechnological work-Laminar air-flow, Centrifuge, pH meter, Incubator, Fermenter, Colony-counter, Autoclave, Inoculating loop and needle, Use of bright-field microscope, Colorimeter and spectrophotometer.	August
2	Qualitative and quantitative estimation of various biomolecules- sugars, proteins; determination of various metabolites in given biological samples, Preparation of standard curve, Preparation of buffers, Preparation of normal, molar, percent solutions, buffer solutions and determination of their pH, Thin-layer, Paper and Two-dimensional Chromatography, Paper electrophoresis.	September
3	Sterilization techniques followed in biotechnology lab.-dry and wet sterilization techniques, Preferred method of sterilization for different materials, Biological indicators for checking the efficiency of sterilization process, Evaluation of different disinfectants and antiseptics and their usage.	October
4	Microorganisms, Preparation of cotton plugs and different types of culture media for growth of microorganisms, animal and plant cell culture media, Preparation of dilutions and isolation of micro-organisms from air, water and soil, sub-culturing/ Picking off technique- streaking, pour-plate, spread plate methods.	November

TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2025-26

Name of the Teacher: Dr. Virender Kumar

Department: Biotechnology

Subject/Course: Major / Immunology (B23-BTY-501)

Programme: B.Sc. LS

Semester: 5th

<i>Unit</i>	<i>Name of Topic/Contents</i>	<i>Tentative Dates/Days</i>
1	Introduction and overview: Introduction and overview of immunology, cells and organs of immune system. Primary and secondary responses. Innate immunity: anatomic, physiological, phagocytic and inflammatory barriers. Adaptive immunity: Humoral and cell-mediated. Interrelationship between innate and acquired immunity.	August
2	Antigens: Concept of antigenicity and immunogenicity, Antigens, epitopes, haptens and adjuvants. Antibodies: basic structure of antibodies, antibody classes and their biological activity, antigenic determinants on immunoglobulins, immunoglobulin super family, antigen antibody interactions: immunoprecipitation, agglutination.	September
3	Basic principles of immune system: Structure and function of B-cell receptor, T-cell receptor. Introduction of self-tolerance and MHC-restriction. Structure and role of Major Histocompatibility Complex, Antigen processing and presentation. Complement system and its activation pathways. Cytokines and their role.	October
4	Immune system in health and disease: Hypersensitivity reactions-their types and mechanism, Autoimmune disorders. Passive and active immunization. Hybridoma technology: production of monoclonal antibodies. Vaccines: live attenuated, killed, subunit, conjugate and DNA vaccines.	November

TENTATIVE LESSON PLAN (SEMESTERS)

SESSION: 2025-26

Name of the Teacher: Dr. Virender Kumar

Department: Biotechnology

Subject/Course: VOC / Food Processing (BTY-VOC-215)

Programme: B.Sc. Ist LS

Semester: 5th

<i>Unit</i>	<i>Name of Topic/Contents</i>	<i>Tentative Dates/Days</i>
1	Introduction: Status of food processing - India vs developed world; Principles of food preservation; Causes of food deterioration; Water activity and its relation with food spoilage Processing and preservation by heat: Heat resistance of microorganisms; Protective effect of food constituents; Blanching; Pasteurization; Sterilization and UHT processing; Effect on foods	August
2	Processing and preservation by low temperature: Refrigeration vs Freezing; Refrigeration system; Freezing curve; Factors affecting freezing rate; Freezing methods and equipment; Effects on foods. Processing and preservation by dehydration: Drying curve; Drying methods and equipment; Changes in food due to drying; Intermediate moisture foods (IMF). Packaging of dried foods, Deterioration of dried foods, Factors affecting drying rate.	September
3	Novel and emerging technologies for food preservation: High pressure processing; Pulsed electric field; Hurdle technology; Ozone application; Ohmic heating; Microwave heating; Technologies for sous-vide ready meals; Membrane technology- RO, NF, UF, MF and Electrodialysis; Membrane materials, Configuration and modules.	October
4	Processing of foods: Concept and science of post- harvest technology, Fruits and vegetables processing and preservation, meat and poultry processing. Concentration: Methods; Equipment; Changes in Food during concentration Irradiation in food preservation: Source; Dose; Direct and indirect effects responsible for death/inactivation of microorganisms; Effect on foods.	November