



I Semester Syllabus
BIOTECHNOLOGY
(w.e.f. 2023-24 Admitted Batch)
23BSC11 INTRODUCTION TO CLASSICAL BIOLOGY

Hours/Week: 5

Credits:4

Unit1: Introduction to systematics, taxonomy and ecology.

- 1.1 Systematics– Definition and concept, Taxonomy –Definition and hierarchy.
- 1.2 Nomenclature– ICBN and ICZN, Binomial and trinomial nomenclature.
- 1.3 Ecology– Concept of ecosystem, Biodiversity and conservation.
- 1.4 Pollution and climate change.

Unit 2: Essentials of Botany.

- 2.1 The classification of plant kingdom.
- 2.2 Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
- 2.3 Structure of flower–Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
- 2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

- 3.1 The classification of Kingdom Animalia and Chordata.
- 3.2 Animal Physiology –Basics of Organ Systems & their functions, Hormones and Disorders
- 3.3 Developmental Biology –Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)
- 3.4 Economic Zoology –Sericulture, Apiculture, Aquaculture

Unit4: Cell biology, Genetics and Evolution

- 4.1 Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.
- 4.2 Chromosomes and heredity–Structure of chromosomes, concept of gene.
- 4.3 Central Dogma of Molecular Biology.
- 4.4 Origin of life

Unit 5: Essentials of chemistry

- 5.1 Definition and scope of chemistry, applications of chemistry in daily life.
- 5.2 Branches of chemistry
- 5.3 Chemical bonds–ionic, covalent, non-covalent– Vander Waals, hydrophobic, hydrogen bonds.
- 5.4 Green chemistry

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BIOTECHNOLOGY
(w.e.f. 2023-24 Admitted Batch)
23BSC12 INTRODUCTION TO APPLIED BIOLOGY

Hours/Week: 5

Credits:4

Unit 1: Essentials of Microbiology and Immunology

- 1.1 History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
- 1.2 Groups of Microorganisms—Structure & characteristics of Bacteria, Fungi, Archaea & Virus.
- 1.3 Applications of microorganisms in—Food, Agriculture, Environment and Industry.
- 1.4 Immune system—Immunity, types of immunity, cells and organs of immune system.

Unit 2: Essentials of Biochemistry

- 2.1 Biomolecules I—Carbohydrates Lipids.
- 2.2 Biomolecules II—Amino acids & Proteins.
- 2.3 Biomolecules III—Nucleic acids—DNA and RNA.
- 2.4 Basics of Metabolism—Anabolism and Catabolism.

Unit 3: Essentials of Biotechnology

- 3.1 History, scope and significance of biotechnology. Applications of Biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
- 3.2 Environmental Biotechnology— Bioremediation and Biofuels, Biofertilizers and Biopesticides.
- 3.3 Genetic engineering— Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical and biological methods of gene transfer.
- 3.4 Transgenic plants—Stress tolerant plants (biotic stress—Bt cotton, abiotic stress—salt tolerance). Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology— Applications

- 4.1 Applications in forensics—PCR and DNA fingerprinting
- 4.2 Immunological techniques— Immunoblotting and ELISA.
- 4.3 Monoclonal antibodies—Applications in diagnosis and therapy.
- 4.4 Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

- 5.1 Data collection and sampling. Measures of central tendency –Mean, Median, Mode.
- 5.2 Measures of dispersion— range, standard deviation and variance. Probability and tests of significance.
- 5.3 Introduction, Genomics, Proteomics, types of Biological data, biological databases- NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment
- 5.4 Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench



II Semester Syllabus

BIOTECHNOLOGY HONOURS (23BT21 MAJOR/MINOR)

(W.e.f. 2023-24 Admitted Batch)

BIOMOLECULES AND ANALYTICAL TECHNIQUES

Hours/week-3

Credits-3

Unit-I-Carbohydrates, Protein and Lipids

1. Classification, structure, properties of carbohydrates, amino acids, peptide bond and peptides.
2. Classification, Structure (primary, secondary, tertiary, quaternary) and functions of proteins. Denaturation and Renaturation of proteins.
3. Classification structure and properties of saturated and unsaturated fatty acids.

Unit-II- Nucleic acid, Vitamins, and Bioenergetics

1. Structure and functions of DNA and RNA.
2. Source, structure, biological role, and deficiency manifestation of vitamin A, B, C, D, E, and K. Free energy, entropy, enthalpy, and redox potential.
3. High energy compounds, Electron-Transport System and Oxidative Phosphorylation.

Unit-III-Centrifugation, Chromatography, and Electrophoresis

1. Basic principles of sedimentation and types of centrifugations.
2. Principle, instrumentation, and application of partition, absorption, paper, TLC, ion exchange, gel permeation, and affinity chromatography.
3. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Introduction to 2D & Isoelectric Focusing.

Unit - IV-Spectroscopy, Microscopy and Laser Techniques

1. Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and application of photoelectric colorimeter and UV-visible spectrophotometer. Introduction to crystallography and application.
2. Types and design of Microscopes - compound, phase contrast, fluorescent electron microscopy (TEM, SEM).
3. Introduction to radioisotopes, measurement of radioactivity (scintillation counter and auto radiography)

Unit -V- Biostatistics

1. Mean, median, mode, standard deviation,
2. One-way ANOVA, Two-way Anova
3. t-test, F-test and chi-square.



II Semester Syllabus
BIOTECHNOLOGY
(w.e.f. 2023-24 Admitted Batch)
23BT22 MICROBIOLOGY, CELL BIOLOGY

Hours/week-3

Credits-3

Unit-I- Scope and Techniques of Microbiology

1. History and contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming.
2. Ultra structure of Bacteria and growth curve. Pure culture techniques.
3. Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Simple, gram and acid-fast staining.

Unit-II-Microbial Taxonomy and Metabolism

1. Concepts of microbial species and strains. Classification of bacteria based on morphology, nutrition and environment. General characteristics, transmission and cultivation of viruses.
2. Structure and properties of plant (Tobacco mosaic virus, TMV), animal (Newcastle disease virus, NDV), human (Human immunodeficiency virus, HIV) and bacterial viruses (T4 phage). Emerging and reemerging viruses (Dengue) and Zoonotic viruses (Rabies, SARS-CoV-2).
3. Microbial production of penicillin. Bacterial toxins, tuberculosis, typhoid. Introduction to fungi, algae and mycoplasma.

Unit-III- Cell Structure and Functions

1. Structure, properties and functions of cellular organelles (E.R, Golgi bodies, Mitochondria, Ribosomes, lysosomes, Nucleus) of eukaryotic cells.
2. Cell cycle and its regulation
3. Cell division (Mitosis and Meiosis).

Unit-IV- CELL SIGNALLING

1. Chemical composition and dynamic nature of the membrane,
2. Cell Surface Receptors
3. cell signaling and communication (GPCR . cAMP, cGMP, IP3-DAG)

Unit – V - Central Dogma of Molecular Biology

1. Genome organization of prokaryotic and eukaryotic organisms
2. Enzymes involved in Replication, Transcription, and Translation
3. DNA repair Mechanism