BOTANY

(Assistant Professor-Higher Education)

(Subject Code-71)

1. **Cell Biology:** Cell as structural and functional unit of life; Prokaryotic and Eukaryotic cell's structural and functional details, structure and function of extra-cellular matrix, cell wall, cell membrane, cell-cell adhesion, membrane transport and vesicular transport, structure and function of cell organelles; Chloroplasts, Mitochondria, Nucleus, Endoplasmic Reticulum Dictyosomes, Ribosomes, Endosomes, Lysosomes, Peroxisomes, Cytoskeleton and Micro-tubules, Chromatin organization and packaging of chromosomes, structure, behavior and significance of Polytene chromosomes and B- chromosomes.
2. **Microbiology and Plant Pathology:** Structure and reproduction/ multiplication of viruses, bacteriophages, bacteria, fungi, mycoplasma and phytoplasma,endophytes and their significance, applications of microbes in agriculture, industry, medicine and in bioremediation; Important crop diseases caused by viruses, fungi bacteria, myco plasma, phytoplasma and nematodes; Mode of infection and disease resistance/ defense mechanism in plants, PR proteins, control measures and biological control, Mycotoxins.
3. **Cryptogams:** Algae, Fungi, Lichens, Bryophytes,Pteridophytes; structure and reproduction from evolutionary point of view; Distribution of cryptogams in India and their ecological as well as economic importance.
4. **Phanerogams:** Gymnosperms, concept of Pro-gymnosperms, classification and distribution of gymnosperms, Salient features of CycadalesGinkgoales, Conferales and Gnetales, their structure and reproduction; General account of Cycadofilicales, Bennettitales and Cordaitales, Geological time scale, Types of fossils and techniques for their study.
   Angiosperms: Systematics, Anatomy, Embryology, Palynology; International Code of Botanical Nomenclature, Numerical Taxonomy, Chemotaxonomy and molecular taxonomy, Evidences from embryology and palynology.
   Comparative account of various systems of classification of angiosperms, study of angiospermicfamilies, Mangnoliaceae, Ranunculaceae, Capparidaceae, Cucurbitaceae, Apiacae, Rubiaceae, Asteraceae, Apocynaceae, Solonaceae, Acanthaceae, Lamiaceae, Verbenaceae, Arecaeae, Liliaceae, Musaceae,Orchidaceae, Poaceae; Unusual secondary growth, Development of male and female gametophytes, fertilization, Development and function of endosperm, Development of embryo, Polyembryony and apomixis, Experimental Embryology including haploid/anther culture, embryo culture and test-tube fertilization.
5. **Plant Resource Development:**Domestication and introduction of plants, Plants as sources for food, fodder, fibers, spices, beverages, edible oils, essential oils, drugs, narcotics, insecticides/pesticides, timber, gums, resins, dyes, latex, cellulose, starch and its products, perfumery, Importance of Ethnobotany in Indian context; Energy plantation; Herbal drugs; Botanical gardens and Herbaria.
6. **Morphogenesis:** Totipotency, polarity, symmetry and differentiation; cell, tissue, organ and protoplast culture, Somatic hybrids and Cybrids, Micro-propagation, Somaclonal variation. Applications of Plant Tissue culture and Synthetic Seed.
7. **Genetics and Evolution:** Gene versus allele concept, Pseudo-alleles, Quantitative genetics and multiple factors, incomplete dominance, Polygenic inheritance, Linkage and Crossing

over, Methods of genemapping including molecular maps; Sex-chromosomes and sex-linked inheritance, sex-determination and molecular basis of sex-differentiation; Mutations-Biochemical and Molecular basis; Cytoplasmic inheritance and cytoplasmic genes (including genetics of male sterility, Back-cross structure of nucleic acids and proteins; Double helical structure of DNA, Genetic code, Concept of gene, Regulation of gene expression; Gene silencing, Multi-gene families, Structure of protein, protein folding, Organic evolution-evidences, Theories of evolution, Role of RNA in origin and evolution, Phylogeny, Construction of Phylogenetic tree.

8. **Biotechnology:** DNA sequencing and its various strategies, Genetic engineering; methods of transfer of genes, Cre-lox system and its application, transgenic crops and bio-safety, Plant genome sequencing, development and use of molecular markers in plant breading, Southern blotting, DNA fingerprinting, PCR-its variations and applications, FISH, Edible vaccines, Plantibodies .

   DNA/gene manipulating enzymes: Endonucleases, Exonucleases, Ligases, Polymerases, Phosphatases, Transcriptases, Transferases; DNA damage and repair, Gene cloning.

   Standard deviation and coefficient of variation, Tests of significance- Z-test, t-test and chi-square test, Probability and distribution, (Normal, binomial and Poison), Co-relation and regression, application of statistics and biology.

9. **Physiology and Biochemistry:** Water relation, mineral nutrition and ion transport, mineral deficiencies and their impact on plants; Photosynthesis-photochemical reactions, photophosphorylation, Z-Scheme, Carbon fixation pathways – C_3, $C_4$and CAM pathways; Oxidative phosphorylation, Chemiosmotic theory and ATP synthesis, glycolytic pathway, Kreb's cycle;

   Lipid metabolism; classification and nomenclature of lipids, synthesis and oxidation of fatty acids.

   Nitrogen fixation and nitrogen metabolism

   Enzymes; Nomenclature, classification, mechanism of action, Enzyme regulation and inhibition, Applications of enzymes, Ribozymes.

   Importance of secondary metabolites, pigments as photo receptor plant movements, Photoperiodism, flowering in plants, Vernalization, senescence; Growth hormones-chemical nature and application in agriculture; Growth indices, growth movements, stress physiology (heat, water, salinity, heavy metals), stress tolerance in plants. Fruit and seed physiology; Seed dormancy, seed germination, fruit ripening – its molecular basis and manipulation

10. **Ecology and Plant Geography:** Concept of ecosystem, Ecological factors, concept and dynamics of community, Plant succession, concept of biosphere, Ecosystem conservation, Pollution and its sources, effects and control, Phytoremediation, plant indicators of pollution,environmental protection acts.

    Forest types of India- Ecological and economic importance of forests, afforestation, deforestation, reforestation, social forestry; endangered plants, endemism, biodiversity and its hotspots, biodiversity conservation, IUCN categories, red data books, protected area network, conventions on biological diversity; farmer's right and intellectual property rights; bio geo chemical cycles; global warming and climatic change, acid rain, eutrophication, Ozone depletion, invasive species, environmental impact assessment, phytogeographical regions of India.