BOTANY—CODE NO. (02)

1. **Cell Biology**.—Structure and function of cell wall (extra cellular matrix or ECM), cell membrane and cell organelles. Nucleus, nucleolus, nuclear pore complex (NPC), chromosome and nucleosome. Mitosis, meiosis, molecular control involving checkpoints in cell division cycle. Differentiation, cellular senescence.

2. **Genetics, Molecular Biology and Biotechnology.**—Laws of inheritance. Concept of gene and allelomorph. Linkage, crossing over and gene mapping. Structural and numerical changes in chromosomes and gene mutations. Sex determination and differentiation. Structure and synthesis of nucleic acids and proteins. Genetic code. Regulation of gene expression. Genetic engineering and crop improvement. Protoplast, cell, tissue and organ cultures. Somatic hybridization. Biofertilizers and biopesticides. Biotechnology in agri-horticulture, medicine and industry.

3. **Tissue Systems.**—Origin, development, structure and function of primary and secondary tissues.

4. **Plant Diversity and Systematics**.—Structure and function of plant forms from evolutionary aspect (viruses to Angiosperms including fossils). Principles of nomenclature, classification and identification of plants. Modern approaches in plant taxonomy. Recent classification of living organisms into three groups (bacteria, archaea and eukarya).

5. **Plant Physiology.**—Water relations. Mineral nutrition. Photosynthesis. Respiration. Nitrogen metabolism. Enzymes and coenzymes. Dynamics of growth, growth movements, growth substances, photomorphogenesis. Secondary metabolites. Isotopes in biological studies. Physiology of flowering.

6. **Methods of Reproduction and Seed Biology**.—Vegetative, asexual and sexual methods of reproduction. Pollination and fertilization. Sexual incompatibility. Development, structure, dormancy and germination of seed.

7. **Plant Pathology**.—Diseases of rice, wheat, sugarcane, potato, mustard, groundnut and cotton crops. Factors affecting infection (host factors, pathogen factors, biotic factors like rhizosphere and phyllosphere organisms). Chemical, biological and genetic methods of disease control (including transgenic plants).

8. **Plant and Environment**.—Biotic and abiotic components. Ecological adaptation. Types of vegetational zones and forests of India. Deforestation, afforestation, social forestry and plant introduction. Soil erosion, wasteland, reclamation. Environmental pollution and its control (including phytoremediation), Bioindicators, Global warming.

9. **Biodiversity, Plant Genetic Resources**.—Methods of conservation of plant genetic resources and its importance. Convention of Biological Diversity (CBD). Endangered, threatened and endemic taxa. Role of cell/tissue culture in propagation and enrichment of genetic diversity. Plants as sources of food, fodder, forage, fibres, oils, drugs, wood and timber, paper, rubber, beverages, spices, essential oils and resins, gums, dyes, insecticides, pesticides and ornamentation. Biomass as a source of energy.

10. **Origin of Life and Evolution**.—Basic concepts of origin of earth and origin of life. Theories of organic evolution, molecular basis of evolution.