

MASTER OF SCIENCE (BOTANY) – SECOND SEMESTER

Second Semester			
S. No.	Name of Subject	Credits	Total Marks
1	Higher Cryptogams, Gymnosperms and Angiosperms	5	100
2	Cytogenetics and Plant Breeding	5	100
3	Plant Physiology and Plant Biochemistry	4	100
4	Cell and Molecular Biology	4	100
5	Practical	4	100
Total		22	

Subject Name: HIGHER CRYPTOGAMS, GYMNOSPERMS AND ANGIOSPERMS

Unit I: Bryophytes

Origin, evolution, classification of Bryophyta. Comparative morphological, anatomical and reproductive study of gametophytes and sporophytes of Bryophytes. Evolution of sporophytes of Bryophytes. Bryophytes as pollution indicator and monitoring.

Unit II: Pteridophyte I

Origin and evolution of pteridophytes; Steller evolution and types of stele in pteridophytes, Telome concept. Heterospory and origin of seed habit in pteridophytes. Classification of vascular cryptogams.

Unit III: Pteridophyte II

Morphological, anatomical and reproductive diversity, sorus evolution in ferns; gametophytic structure in eusporangiate and leptosporangiate forms and evolution of sex in pteridophytes.

Unit IV: Gymnosperms

Gymnosperms classification and salient features of major taxa; characteristics, affinities and relationships of Cycadofilicales, Bennettitales and Cordaitales. Characteristics, affinities and relationships of Ginkgoales, Coniferales, Taxales and Gnetales. Economic importance of Gymnosperms.

Unit V: Angiosperms

Systematics: Outline of classification of Angiosperms; Hutchinson, Takhtajan, Cronquist, merits and demerits,

Diagnostic characteristics, systematic phylogeny and economic importance of families: Magnoliaceae, Capparidaceae, Rosaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Bignoniaceae, Lamiaceae, Verbenaceae, Polygonaceae, Euphorbiaceae, Orchidaceae, Zingiberaceae, Araceae, Cyperaceae and Poaceae

Molecular approaches to plant taxonomy: Application of DNA markers in angiosperm taxonomy; molecular phylogeny

Subject Name: CYTOGENETICS AND PLANT BREEDING

Unit I:

General account, structure and function of chromosome, special chromosome.

Cell division –importance of cell division, cell cycle.

Mitosis-different stages.

Meiosis-different stages, role of meiosis in inheritance.

Chromatin organization and replication: Chromosome structure and packaging of DNA, nucleosome assembly and deassembly, histones, euchromatin and heterochromatin.

Cytogenetics of haploids: Haploidy/monoploidy, meiosis and breeding behaviour of haploids, uses of haploids in plant breeding, genetic and cytogenetic studies.

Unit II:

Mendel's law of inheritance, chromosomal theory of heredity.

Gene and gene interactions (epistasis, supplementary, complementary and duplicate genes), multiple alleles.

Linkage and crossing over, extra nuclear inheritance.

Sex chromosome and sex determination.

Chromosomal aberrations: structural and numerical, polyploidy: euploidy and aneuploidy, their importance in inheritance.

Mutation, Types of Mutation and Mutagens.

Unit III:

Cell signaling: cell surface receptor; G-protein coupled receptors; secondary messengers and signal transduction pathway.

Unit IV:

Principles: self-pollinated plants- selection, hybridization (techniques and consequences).

Principles: Cross pollinated plants: selection, heterosis and inbreeding depression.

Methods: self-pollinated plants- mass selection, pureline selection, pedigree selection, bulk method, backcross method.

Methods: cross pollinated plants-population improvement, hybrid and synthetic varieties.

Subject Name: PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY

Unit I

Fundamentals of enzymology: General aspects, international classification of enzymes, prosthetic groups and coenzymes, mechanism of catalysis, kinetics, Michaelis-Menten equation, bisubstrate reactions, active sites, factors contributing to the catalytic efficiency, regulatory enzymes, isozymes

Unit II

Water relations in plants: Unique physico-chemical properties of water, chemical potential and water potential of the plant. Ion uptake, mechanism of individual cells and roots interaction between ions. Transport and translocation of ions, solutes and macromolecules from soil, through cells, across membrane, through xylem and phloem, dual action of ATPases/pumps and modulation of their activity; specialized mechanisms for phosphorous and iron uptake. Mechanism of stomatal transpiration.

Unit III

Photosynthesis: Mechanism of photosynthesis, pigment protein complexes, mechanism of pigment system function, cyclic and non-cyclic electron flow, photophosphorylation; C₃, C₄ and CAM pathways of carbon fixation. C₂ photorespiratory cycle. Formation of glycolate and its oxidation. Regulation of photorespiration and its significance; Plant growth regulators: Auxins, gibberellins, cytokinins, abscisic acid and ethylene; Physiological effects and mechanism of action of plant growth hormones

Unit IV

Physiology of flowering- Photoperiodism and vernalization.

Phytochrome: phytochrome as a photoreceptor, Phytochrome mediated responses. Germination and dormancy: Factors of seed and bud dormancy- Methods of breaking dormancy, germination stimulators and inhibitors; Stress physiology: Water stress, drought, frost, salinity and global warming

Subject Name: CELL AND MOLECULAR BIOLOGY

Unit I: Techniques in cell biology

Microscopy: Principles of microscopy, Light microscope: its principles and uses.

Phase contrast microscope, fluorescence microscope.

Electron microscope: Transmission electron microscope (TEM) and Scanning electron microscope (SEM).

Unit II: Cell components and their functions

Cell and cell organization.

Protoplast- physical and chemical nature, Structure and function of plasma membrane, Nucleus-structure, composition, function, chromatin structure in eukaryotes, Karyotype; Lampbrush and Polytene chromosome; heterochromatin, euchromatin

Cellular organelles (Mitochondria, Golgi bodies, Endoplasmic reticulum, Lysosome, Vacuoles).

Chloroplast: structure, function.

Cytoskeleton.

Unit III: Nucleic acid

Double helical structure of DNA; A, B, Z DNA; DNA replication in prokaryotes and eukaryotes; DNA damage and repair; DNA packaging; centromere, telomere; C-value paradox; Structure of RNA: mRNA, rRNA and tRNA; repetitive DNA; interrupted genes; gene families; transposons.

Unit IV: Protein synthesis

Machinery and mechanism of protein synthesis. Autogenous regulation of ribosomal protein synthesis. Operon concept, post transcription and translational modifications

Subject Name: PRACTICAL