

M.Sc. Part –I

Semester –I

Botany Paper –I

(Diversity of Plant microbes)

1. **Bacteria-** Archaeobacteria and Eubacteria, general account, ultra structure, nutrition and reproduction, biology and economic importance.
2. **Viruses-** Ultra structure of viral particles, isolation and purification of viruses, chemical nature, replication, transmission of viruses, Concept of prions.
3. **Fungi-** classification (Ainsworth and Beesy) General characters, reproduction and life cycles of fungi with reference to Mastigomycotina (Uromyces, Melampsora, ustilago); Deuteromycotina (Fusarium, Scelerotium).
4. Heterothallism, Parasexuality, Economic importance of fungi, Role of fungi in agriculture, medicine, Biofertilizer, Mycorrhiza.

M.Sc. Part –I
Semester –I
Botany Paper –I
(Diversity of Plant microbes)

Algae:

1. General character, thallus organization, cell ultra structure, reproduction (Vegetative, Asexual and Sexual).
2. Criteria for classification of algae, Cell wall pigment, reserve food, Flagella.
3. Classification, Sillent features of Protochlorophyta, chlorophyta, charophyta, Xanthophyta, Bacillariophyta, Phaeophyta, Rhodophyta, Cyanophyta.
4. Economic importance of algae as food, feed & uses in industry.
Algal blooms & algal biofertilizers.

Bryophyta:

5. General character, origin, evolution, classification, Morphology, structure, reproduction, and life history, distribution of Bryophytes.
6. Classification, general account of Marchantiales, Jungermaniales, Anthocerotales, Sphagnales, Funariales and Polytrichales.
7. Economic and ecological importance of bryophytes.
8. Reduction in sporogenous tissue and evolution of saprophyte.

M.Sc. Part –I
Semester –I
Botany Paper –III
(Pteridophyta)

1. General characters, classification, evolution of steles.
2. Morphology, anatomy and reproduction, homo and heterospory, origin of seed habit in Pteridophytes.
3. General account of fossil pteridophyta.
4. Introduction to:
 - a. Psilopsida- eg. Of Psilotum
 - b. Lycopsida- Lycopodium, isoetes, Selaginella.
 - c. Sphenopsida- equisetum.
 - d. Pteridopsida- Ophioglossum, Osmunda, Marsilea. Gleichenia, and Azolla.

M.Sc. Part –I

Semester –I

Botany Paper –IV

(Gymnosperm)

1. General characters and classification of gymnosperms.
2. Distribution and economic importance of gymnosperm with special reference to India.
3. (a). General account of the structure & reproduction of the following-
 1. Petridospermales- (Lyginopteridaceae, Medullosaceae, Caytoniaceae, Glossopteridaceae).
 2. Cycadeoidales
 3. Cordaitales
- (b). General account of the structure & reproduction of the following-
 1. Ginkgoales e.g. Ginkgo
 2. Coniferales e.g. Pinus, Taxodium, Araucaria, Cephalotaxus.
 3. Taxales e.g. taxus.
 4. Ginetales e.g. Ginetum, Ephedra.
 5. Welwitschiales e.g. Welwitschia.

M.Sc.

Semester –II

Botany Paper –I

(Taxonomy of higher Plants & Economic Botany)

1. Scope of taxonomic: Introduction, Principles of taxonomy, taxonomic Hierarchy, Botanical nomenclature & ICN.
2. Recent Trends: Chemo taxonomy, Numerical taxonomy, & Molecular taxanomy (ABG system).
3. System of classification: Phenetics versus phylogenetics system: significance, merits & demerits, and brief studies of following system of classification: Bentham & Hooker, Engler & Prantl and Takhtajan.
4. Salient feature of the following families: Ranunculaceae, Capparidaceae, Tiliaceae, Fabaceae, Anacardiaceae, Sapindaceae, Asteraceae, Primulaceae, Sapotaceae, Oleaceae, Boraginaceae, Polygonaceae, Amarantaceae, Hydrocharitaceae, Amaryllidaceae, Orchidaceae, liliaceae, Cyperaceae, Poaceae.
5. Economic Botany: Forage and fodder plants, Medicinal plants, Timber, Gum, Resin, Oil yielding plants.

M.Sc.
Semester –II
Botany Paper –II
(Cell Biology of Plants)

1. Cell wall- Structure and functions, biogenesis growth.
2. Plasma-Membrane - Structure, models & functions, sites for ATPase, Ion carriers channel, pump receptors.
3. Plasmodesmata- Structure, role in movement of molecules, comparison with gap junction.
4. Chloroplast- Structure and function, genome organization.
5. Mitochondria- Structure, genome-structure, biogenesis.
6. Plant vacuoles- Membrane transporters, as storage organelles.
7. Nucleus- Structure, nuclear pores, nucleosome organization, DNA structure (A,B & Z form), replication.
8. Ribosome- Structure, function, sites of protein synthesis.
9. Cell Shape & Motility – The cytoskeleton, organization and role of microtubules & microfilaments, motor movements, implication in flagellar & other movements.
10. Cell division, cell cycle & apoptosis- Regulation of cell cycle, mechanism of programmed cell death, Retinoblastoma and E2F protein.
11. Other cellular Organelles- Structure & function of microbodies, golgi-appartus, lysosomes, endoplasmic reticulum.

M.Sc.

Semester –II

Botany Paper –III

(Genetics)

1. Chromosomes- Morphology and structure, packaging of DNA, C- value paradox, Cot curve and its significance.
2. Mutation- Structural and Numerical Aberrations, molecular basis of mutations, DNA damage and repair, Evolution of major crop plants, transposable genetics elements.
3. Neo Mendelism, interaction of gene and quantitative inheritance.
4. Mechanism of Genetic recombination, linkage and crossing over, linkage groups, role of rec A, rec B, C, D enzymes.
5. Gene Concept- Benzer's experiment in gene concept Cistron, Recon, Muton, Split gene and overlapping gene, jumping gene.
6. Gene expression (Protein synthesis) and regulation (Prokaryotes and Eukaryotes) Lac operon and Tryp operon.

M.Sc.

Semester –II

Botany Paper –IV

(Structure, Development and Reproduction of flowering plants)

1. Shoot development- Organisation of shoot, apical meristem (SAM), Cambium anomaly, xylem and phloem, secretary ducts and laticifers, wood development.
2. Leaf growth and differentiation- Phyllotaxy, differentiation of epidermis (with special reference to stomata and trachoma's) and mesophylls.
3. Root Development- Organization of root apical meristem (RAM) differentiation, vascular tissue differentiation, lateral roots, root hairs.
4. Male gametophyte- Structure of anther, Microsporogenesis, role of tapetum, pollen development, pollen germination, pollen tube growth guidance.
5. Female gametophyte- ovule development, Megasporogenesis, organization of embryosac and structure of embryosac.
6. Pollination- types of pollination, Pollen- Pistil interaction and self incompatibility, floral characteristics of self and cross pollinated plants, pollination mechanism and vectors, Double fertilization, in – vitro fertilization.
7. Seed development and fruit growth- Endosperms, embryo and polyembryony.

M.Sc.
Semester –III
Botany Paper –I
(Microbiology)

1. History and development of Microbiology, Golden era of microbiology and its scope, Diversity of Microbes in Air, Water and Soil.
2. Micro- organism in Food Processing: Cheese, Butter milk, Bread and Vinegar.
3. Micro- Organism in relation to Biotechnology:
 - i. Vaccine production, Antibiotic production, Enzyme production, Alcohol production.
 - ii. Role of micro-organisms in sewage treatment and Alternative source of energy, Microbiology of Potable water.
4. Micro- Organism and maintenance of Environment, Bioremediation of heavy metal, Biodegradation of Pesticides, Single Cell Protein, Oriental Fungal Food (Mycoproteins).

M.Sc.
Semester –III
Botany Paper –II
(Plant Physiology)

1. Membrane transport and translocation of water and solutes, plant water relation-Diffusion, imbibition, osmosis, plasmolysis, DPD, water potential, water transport through xylem, comparison of Xylem and phloem transport, phloem loading and unloading, Passive and active solute transport, membrane transport protein, water loss.
2. Respiration- Overview of plant respiration, glycolysis and TCA cycle, electron transport and ATP synthesis. Pentose Phosphate Pathway, Glyoxalate cycle, alternate oxidase system.
3. Photochemistry and Photosynthesis- General concept and historical backgrounds, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, photooxidation of water, mechanism of electron and proton transport, carbon assimilation, Calvin cycle, photorespiration and its significance, the C_4 Cycle, CAM pathway, biosynthesis of starch and sucrose, physiology and Ecological considerations.
4. Sensory photobiology- History and discovery of Phytochromes and cryptochromes and their photochemical and biochemical properties, photophysiology of light induced response, cellular localization, and molecular mechanisms of photomorphogenetic response.
5. Plant growth regulatory and Elicitor: Physiological effects and mechanism, Action of auxines, gibberellins, Cytokinins, ethylene, Abscisic acid.
6. Flowering process- Photoperiodism and its significance, Endogenous clock and its regulation, floral induction and development, genetic and molecular analysis, role of vernalisation.
7. Stress Physiology- Plant response to biotic, abiotic stress tolerance HR and SAR, water deficit and drought resistance salinity stress, metal toxicity freezing and heat stress, oxidative stress.

M.Sc.

Semester –III

Botany Paper –III

(Biochemistry)

1. Energy Flow- Principles of thermodynamics, free energy and chemical potential, Redox-reaction, structure and function of ATP
2. Fundamentals of Enzymology- General aspects allosteric mechanism regulatory and active sites, isozymes, Kinetics of enzymatic catalysis, Michaelis-Menten equation and its significance.
3. Signal transduction- Overview, receptors and G- proteins, phospholipids signalling, role of cyclic nucleotides. Calcium calmodulin cascade, diversity in protein kinases and phosphatases, specific signalling mechanism, Signal transduction pathway.
4. Lipid metabolism- Structure and function of lipid, fatty acid biosynthesis, synthesis of membrane lipids, structural and storage lipids and their catabolism.
5. Nitrogen fixation, nitrogen and sulphur metabolism- Biological nitrogen fixation in details, sites of N_2 fixation, nodule formation and nod factors, nif genes, mechanism of N_2 fixation in free living and symbiotic systems, ammonium assimilation, sulphate uptake, transport and assimilation.

M.Sc.

Semester –III

Botany Paper –IV

(Plant Ecology)

1. Vegetational organisation- Concept of community and continuum, Analysis of community (analytic and synthetic character, community coefficient, interspecific association, concept of ecological niche, gene ecology).
2. Vegetation Development- Temporal changes (cyclic and non-cyclic). Mechanism of ecological succession (Rely and Initial floristic composition, facilitation, Tolerance and inhibition models), Changes in ecosystem properties during succession.
3. Ecosystem organisation- Structure and function of ecosystem, primary productivity (method of measurement), tropic organization, energy flow pathway, ecological efficiencies; Litter fall & decomposition.
4. Climate Change- Green house gases (CO_2 , N_2O , CFC_s : sources trends and role) ozone layer and ozone hole, consequences of climate change (CO_2 fertilization, Global warming, Sea level rise, UV radiation).

M.Sc.

Semester –IV

Botany Paper –I

(Molecular Biotechnology)

1. Recombinant DNA technology- Gene cloning, Restriction enzymes and their mode of action, foreign DNA, vectors, principles & techniques, Construction of genomic and c-DNA libraries, DNA sequencing- MAX & Gilbert method, Chain termination method, PCR, DNA fingerprinting.
2. Genetic Engineering of Plant- Strategies for development of transgenic plants (with suitable example). Agrobacterium – the natural genetic engineers, t-DNA property rights, Ethical concern, Rules of release of G.M. plant in India.
3. Microbial genetic manipulation- Bacterial transformation, selection of recombinants & transformations, genetics improvements of industrial microbes. Fermentations technology, designing of fermentor, operation of fermentor.
4. Genomics & Proteomics- Genetic and physical mapping of genes, molecular marker (RFLP, RAPD, STR, MSDNA) Artificial chromosomes, Rice genome project, Bioinformatics (Tools of Bioinformatics, sequencing, data bases), Golden rice, Genomics (functional, structural, comparative). Microarray, Protein profiling and its significance.

M.Sc.
Semester –IV
Botany Paper –II
(Environmental Biology)

1. Environmental pollution: Air, Water, Soil, Noise & Radioactive pollution & their control.
2. Biodiversity: Definition, magnitude, levels, cause of depletion, categories of depleted taxa.
3. Sustainable development: concept, scope of sustainable development.
4. Natural Resources: Types, Uses, & it's conservation.
5. (a) In situ conservation: Principles, protected areas of India, Sanctuaries, national parks, biosphere reserve, wetland, mangrove & coral reefs for conservation of wild biodiversity.
(b) Ex Situ conservation: Principle & practices, botanical gardens, gene bank, seed bank, cryobiology, general account of the activities of BSI, NBPGR, ICAR, CSIR, NBA, & DBT for conservation.
6. Environmental episodes: Bhopal tragedy, Chernobyl disaster, Photochemical smog. Threat to Taj Mahal & monuments, Chipko & Apiko movement.
7. Environmental Laws.

M.Sc.

Semester –IV

Botany Special Paper –I

(Plant Pathology)

1. Introduction and history of plant pathology- General account, history of Indian plant pathology, pathogen, plant disease, endemic and epidemic, sporadic disease.
2. Symptom of plant disease- symptoms caused by fungi, bacteria, plant viruses, mycoplasma and nematodes.
3. Host pathogen interaction- Modes of entry of pathogen and infection, roles of hosts, enzymes and toxins in development plant diseases, change in host.
4. Plant disease control- physical, chemical and biological control, environmental factors, pesticides like fungicides, fumigants and antibiotic, integrated disease management.
5. Local important plant diseases- late blight of potato, Powdery mildew of pea, Wilt of arahar, Leaf spot of crucifer, Stem gall of coriander, Citrus canker, Blight of rice, yellow vein mosaic of bhindi, Bunchy top of banana, Little leaf of brinjal, grassy shoot of sugarcane, Damping of seedlings, Tungro disease of rice, Scab disease of potato, ring rot of Potato, Mosaic of Bhindi.

M.Sc.
Semester –IV
Botany Special Paper –II
(Plant Tissue Culture)

1. Introduction- History and scope of plant biotechnology.
2. Totipotency and concept of cellular differentiation, plant cell and tissue culture, embryo culture, embryo rescue.
3. Organogenesis and adventives embryogenesis- Fundamentals aspects of morphogenesis and androgenesis, mechanisms, techniques and utility, mentor technology.
4. Somatic hybridization- Protoplast isolation, Fusion and culture, hybrid selection and regeneration, possibilities, achievements and limitations of protoplast research, cybridization and cybrid production, electroporation, particle bombardment of gun, biolistic missile.
5. Application of plant tissue culture- Clonal propagation, artificial seed, production of secondary metabolism, natural products, future of plant tissue culture technology in India, cryopreservation and germplasm storage.