

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

Syllabus: Botany

**Name of the Course: Entrance Examination – Paper II
(PET- 9)**

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

PET PAPER II Syllabus for Botany 2024

Unit I: Biology & Diversity of Algae, Fungi, Bryophytes, Pteridophytes & Gymnosperms

- **Algae:** Algae in diversified habitats (terrestrial, fresh water and marine water), thallus organization, Salient features of Algae, Economic Importance of algae.
- **Fungi:** General characters and classification (Ainsworth's 1973 system), Cell ultrastructure and Cell wall composition, nutrition (saprobic, biotrophic, symbiotic), reproduction (vegetative, asexual and sexual), fructification and Spore forming structures, heterothallism, heterokaryosis parasexuality. Economic Importance of Fungi.
- **Bryophytes:** Diversity in Bryophytes with respect to thallus structure, reproduction, life cycle, Salient features of Bryophytes. Economic importance of Bryophytes.
- **Pteridophyte:** Diversity in Pteridophytes with respect to morphology, anatomy, reproduction, Salient features of Pteridophytes, Economic Importance of Pteridophytes.
- **Gymnosperms:** Diversity of Gymnosperms with respect to morphology, anatomy, reproduction, Salient features of Gymnosperms, Economic importance of Gymnosperms

Unit II: Plant Systematics

- **Introduction:** Aims, principles of taxonomy, types of taxonomy, chemotaxonomy, numerical taxonomy, serotaxonomy
- **Tools in taxonomy:** Floras, monographs, revisions, websites. Herbarium and botanical gardens, their role in teaching, research and conservation, steps in herbarium preparation, important herbaria in India.
- **Classification:** Artificial, Natural & Phylogenetic system of classification, Bentham & Hooker's system of classification, Cronquist, Takhtajan, APG system of classification features used in identification, citation of authority, rejection of names, priority of publication, ICN Principles.

Unit III: Physiology of Plants

- **Solute transport and photoassimilate translocation:** uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem, transpiration, mechanisms of loading and unloading of photoassimilates.
- **Photosynthesis:** Light harvesting complexes; mechanisms of electron transport; CO₂ fixation-C₃, C₄ and CAM pathways.

- **Respiration and Photo respiration:** Glycolysis, Acetyl CoA formation, Citric acid cycle, plant mitochondrial electron transport and ATP synthesis, alternate oxidase, photo respiratory pathway.
- **Plant Hormones:** Biosynthesis, storage, breakdown and transport, physiological effects and mechanisms of action. Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Structure, function and mechanisms of action of phytochromes and cytochromes.

Unit IV: Genetics

- **Mendelian Principles:** Dominance, segregation, independent assortment, Codominance, incomplete dominance, gene interactions, pleiotropy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
- **Concept of gene & Gene mapping methods:** Allele, multiple alleles, pseudoallele, complementation tests, Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.
- **Mutation:** Causes and detection, mutant types, Structural and numerical alterations of chromosomes Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
- **Microbial genetics:** Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

Unit V: Molecular Biology and Plant Biotechnology

- **Molecular Biology:** Structure of DNA and RNA, Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, Analysis of RNA, DNA and proteins by gel electrophoresis, Isoelectric focusing gels. Isolation, separation and analysis of Protein molecules RFLP, RAPD and AFLP techniques. DNA sequencing methods, strategies for genome sequencing.
- **Recombinant DNA methods:** Generation of genomic and cDNA libraries. Phage, cosmid, BAC and YAC vectors. Cloning of DNA or RNA fragments in bacterial and eukaryotic systems. Enzymes involved in recombinant technology, transgenic plants.
- **Plant Tissue Culture:** Introduction to Plant Tissue culture, Terms and definitions, Laboratory organization, Tools and techniques, methods of sterilization. Role of Micro and macro nutrients, Vitamins and carbon source in tissue culture, Media preparation- pH, Temperature, Solidifying agents, Slant Preparations etc. Maintenance of cultures, Environmental Conditions, explants characteristics. Anther culture, ovary culture, Protoplast culture, embryo culture, endosperm culture, micro propagation and Somatic hybridization.

Unit VI: Ecology

- **The Environment:** Biotic and abiotic interactions. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
- **Population Ecology:** Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of meta-population – demes and dispersal, interdemic extinctions, age structured populations.
- **Ecosystem Ecology:** Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N and P); primary production and decomposition; structure and function of ecosystems: terrestrial and aquatic.
- **Community Ecology:** Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

Unit VII: Tools and Techniques

- Microtomy and Micrometry, Microscopy, SEM and TEM, Spectrophotometer, GC, Electrophoresis, HPLC, radioactive techniques, Biostatistical applications in research. Remote sensing.