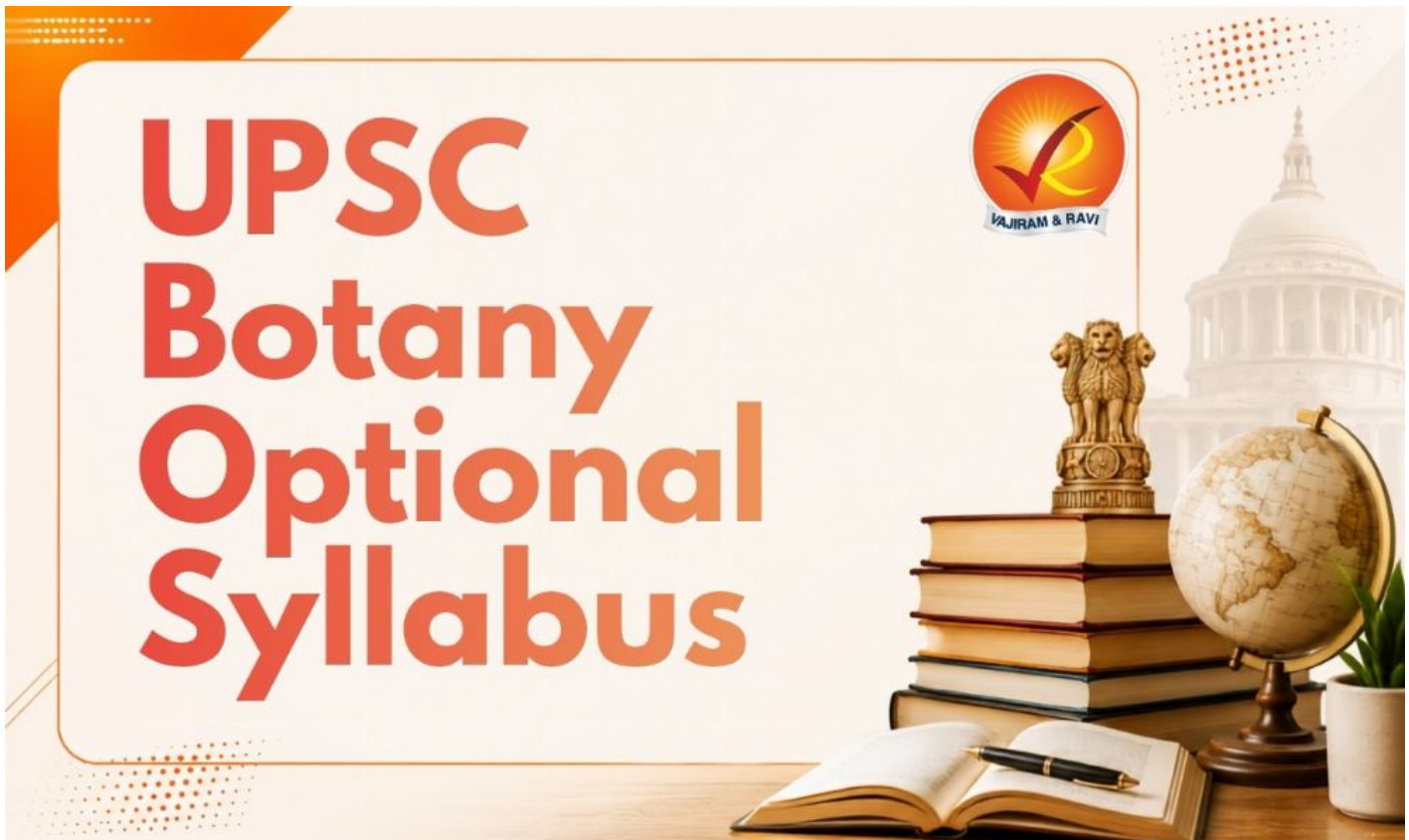


UPSC Botany Syllabus 2026 for Mains Papers I and II

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The Botany syllabus for UPSC Mains is designed for candidates who have a strong foundation in plant sciences and wish to opt for this subject as their optional. It covers a broad range of topics, from the fundamental concepts of plant anatomy and physiology to more advanced areas such as genetics, biotechnology, and ecology. The syllabus is structured to test both theoretical knowledge and practical application, ensuring that candidates can demonstrate a deep understanding of the subject matter in relation to the demands of the Civil Services Examination.

UPSC Botany Optional Syllabus

The Botany optional in UPSC consists of two papers—Paper I and Paper II—each carrying 250 marks. These papers are structured to evaluate the candidate's grasp of botanical concepts and their analytical skills. Paper I is divided into two sections, each containing four questions. Candidates must answer Question 1 from Section 1 and Question 5 from Section 2, as these are compulsory. For the remaining six questions, candidates can strategically choose those where they feel most confident, allowing them to maximize their score by selecting the questions they can answer best.

UPSC Botany Syllabus for Paper 1

Paper 1 of the UPSC Botany syllabus covers foundational concepts in plant biology, including plant anatomy, taxonomy, physiology, and ecology. This paper requires a strong grasp of basic botanical principles and their applications. It forms the backbone for advanced topics in the subject.

Paper I Syllabus

Topics	Detailed Syllabus
1. Microbiology and Plant Pathology	• Structure and reproduction/multiplication of viruses, viroids, bacteria, fungi and mycoplasma; Applications of microbiology in agriculture, industry, medicine and in control of soil and water pollution; Prion and Prion hypothesis. • Important crop diseases caused by viruses, bacteria, mycoplasma, fungi and nematodes; Modes of infection and dissemination; Molecular basis of infection and disease resistance/defense; Physiology of parasitism and control measures. Fungal toxins. Modeling and disease forecasting; Plant quarantine.
2. Cryptogams	• Algae, fungi, lichens, bryophytes, pteridophytes-structure and reproduction from evolutionary viewpoint; Distribution of Cryptogams in India and their ecological and economic importance.

3. Phanerogams	• Gymnosperms : Concept of Progymnosperms. Classification and distribution of gymnosperms. Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales, their structure and reproduction. • General account of Cycadofilicales, Bennettitales and Cordaitales; Geological time scale; Type of fossils and their study techniques. • Angiosperms : Systematics, anatomy, embryology, palynology and phylogeny. Taxonomic hierarchy; International Code of Botanical Nomenclature; Numerical taxonomy and chemotaxonomy; Evidence from anatomy, embryology and palynology. • Origin and evolution of angiosperms; Comparative account of various systems of classification of angiosperms; Study of angiosperm families— Mangnoliaceae, Ranunculaceae, Brassicaceae, Rosaceae, Fabaceae, Euphorbiaceae, Malvaceae, Dipterocarpaceae, Apiaceae, Asclepiadaceae, Verbenaceae, Solanaceae, Rubiaceae, Cucurbitaceae, Asteraceae, Poaceae, Arecaceae, Liliaceae, Musaceae and Orchidaceae. • Stomata and their types; Glandular and non-glandular trichomes; Unusual secondary growth; Anatomy of C3 and C4 plants; Xylem and phloem differentiation; Wood anatomy. • Development of male and female gametophytes, pollination, fertilization; Endosperm—its development and function. Patterns of embryo development; Polyembryony, apomixis; Applications of palynology; Experimental embryology including pollen storage and test-tube fertilization.
4. Plant Resource Development	• Domestication and introduction of plants; Origin of cultivated plants, Vavilov's centers of origin. Plants as sources for food, fodder, fibers, spices, beverages, edible oils, drugs, narcotics, insecticides, timber, gums, resins and dyes; latex, cellulose, starch and its products; Perfumery; Importance of Ethnobotany in the Indian context; Energy plantations; Botanical Gardens and Herbaria.
5. Morphogenesis	• Totipotency, polarity, symmetry and differentiation; Cell, tissue, organ and protoplast culture. Somatic hybrids and Cybrids; Micropropagation; Somaclonal variation and its applications; Pollen haploids, embryo rescue methods and their applications.

UPSC Botany Syllabus for Paper 2

Paper 2 focuses on applied botany, emphasizing the economic and social relevance of plants. This paper also addresses plant pathology, tissue culture, and the impact of climate change on vegetation. It is designed to test the candidate's knowledge of how botanical science can be applied to solve real-world problems.

Paper II Syllabus

Topic	Detailed Syllabus
1. Cell Biology	Techniques of cell biology. Prokaryotic and eukaryotic cells—structural and ultrastructural details; Structure and function of extracellular matrix (cell wall) and membranes-cell adhesion, membrane transport and vesicular transport; Structure and function of cell organelles (chloroplasts, mitochondria, ER, dictyosomes ribosomes, endosomes, lysosomes, peroxisomes; Cytoskeleton and microtubules; Nucleus, nucleolus, nuclear pore complex; Chromatin and nucleosome; Cell signaling and cell receptors; Signal transduction Mitosis and meiosis; molecular basis of cell cycle. Numerical and structural variations in chromosomes and their significance; Chromatin organization and packaging of genome; Polytene chromosomes; B-chromosomes—structure, behavior and significance.
2. Genetics, Molecular Biology and Evolution	- Development of genetics, and gene versus allele concepts (Pseudoalleles); Quantitative genetics and multiple factors; Incomplete dominance, polygenic inheritance, multiple alleles; Linkage and crossing over of gene mapping including molecular maps (idea of mapping, function); 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) - Structure and synthesis of nucleic acids and proteins; Genetic code and regulation of gene expression; Gene silencing; Multigene families; Organic evolution-evidences, mechanism and theories. - Role of RNA in origin and evolution.
3. Plant Breeding, Biotechnology and Biostatistics	Methods of plant breeding—introduction, selection and hybridization (pedigree, backcross, mass selection, bulk method); Mutation, polyploidy, male sterility and heterosis breeding. Use of apomixis in plant breeding; DNA sequencing; Genetic engineering—methods of transfer of genes; Transgenic crops and biosafety aspects; Development and use of molecular markers in plant breeding; Tools and techniques— probe, southern blotting, DNA fingerprinting, PCR and FISH. Standard deviation and coefficient of variation (CV). Tests of significance (Z-test, t-test and chi-square tests). Probability and distributions (normal, binomial and Poisson). Correlation and regression.

4. Physiology and Biochemistry	• Water relations, mineral nutrition and ion transport, mineral deficiencies. Photosynthesis— photochemical reactions, photophosphorylation and carbon fixation pathways; C3, C4 and CAM pathways; Mechanism of phloem transport, Respiration (anaerobic and aerobic, including fermentation)—electron transport chain and oxidative phosphorylation; Photorespiration; Chemiosmotic theory and ATP synthesis; Lipid metabolism; Nitrogen fixation and nitrogen metabolism. Enzymes, coenzymes; Energy transfer and energy conservation. Importance of secondary metabolites. Pigments as photoreceptors (plastidial pigments and phytochrome). Plant movements; Photoperiodism and flowering, vernalization, senescence; Growth substances—their chemical nature, role and applications in agri-horticulture; growth indices, growth movements. Stress physiology (heat, water, salinity, metal); Fruit and seed physiology. Dormancy, storage and germination of seed. Fruit ripening—its molecular basis and manipulation.
5. Ecology and Plant Geography	• Concept of ecosystem; Ecological factors. Concepts and dynamics of community; Plant succession. Concepts of biosphere; Ecosystems; Conservation; Pollution and its control (including phytoremediation); Plant indicators; Environment (Protection) Act. • Forest types of India—'Ecological and economic importance of forests, afforestation, deforestation and social forestry; Endangered plants, endemism IUCN categories, Red Data Books; Biodiversity and its conservation; Protected Area Network; Convention of Biological Diversity, Farmers' Rights; and Intellectual Property Rights; Concept of Sustainable Development; Biogeochemical cycles. Global warming and climatic change; Invasive species; Environmental Impact Assessment; Phytogeographical regions of India.

UPSC Botany Optional Syllabus- Preparation Strategy

Preparing for the UPSC Botany optional requires a well-structured strategy that balances comprehensive coverage of the syllabus with focused revision.

- Begin by thoroughly understanding the syllabus and dividing it into manageable sections. Prioritize topics that are both fundamental and high-scoring, such as Plant Physiology, Genetics, and Ecology.
- Consistent revision, combined with regular answer writing practice, is key to mastering the subject.
- Referring to standard textbooks, analyzing previous years' question papers, and staying updated on recent developments in the field will further enhance your preparation, enabling you to approach the exam with confidence.

Books to Study for UPSC Botany Syllabus

Selecting the right books is crucial for mastering the UPSC Botany syllabus. Focus on standard texts such as "Plant Physiology" by Taiz and Zeiger and "A Textbook of Botany" by E.C. Jeffrey, which covers essential concepts and provides in-depth knowledge required for the exam.

Paper I	Paper II
• Prescott's Microbiology • Plant Pathology by George N Agrios • A Text Book of Botany by Singh, Pandey and Jain • Gymnosperms by S. P. Bhatnagar, Alok Moitra • Plant Systematics by Gurucharan Singh • Plant Anatomy by Dr. B. P. Pandey • The Embryology of Angiosperms by Sant Saran Bhojwani and S. P. Bhatnagar • Plant Tissue Culture: Theory and Practice by S.S. Bhojwani, M.K. Razdan • Economic Botany: A Comprehensive Study by SL Kochhar	• Karp's Cell Biology by Karp Gerald • Concepts of Genetics by Klug and Cummings • Plant Breeding: Principles and Methods by B D Singh • Biotechnology: Expanding Horizons by B D Singh • Fundamentals of Biostatistics by Veer Bala Rastogi • Plant Physiology and Development by Eduardo Zeiger, Lincoln Taiz • Ecology and Environment by Dr. P D Sharma + Resources from Newspapers, Magazines and Web resources

Important Topics in UPSC Botany Syllabus

Here are the important topics in the UPSC Botany syllabus:

- **Plant Morphology:** Study the structure, function, and development of plant organs like roots, stems, leaves, and flowers.
- **Plant Anatomy:** Focus on the internal structure of plants, including tissues, cell types, and anatomical adaptations.
- **Plant Physiology:** Understand physiological processes such as photosynthesis, respiration, and plant nutrition.
- **Plant Ecology:** Explore plant interactions with their environment, including ecosystems, biodiversity, and environmental adaptation.
- **Plant Systematics and Taxonomy:** Learn plant classification, nomenclature, and identification of various plant families and genera.
- **Genetics and Evolution:** Study plant genetics, inheritance patterns, and evolutionary processes.
- **Economic Botany:** Examine the role of plants in agriculture, medicine, and industry, including the use of plant products.

Other Related UPSC Optional Syllabus		
UPSC Commerce Optional Syllabus	UPSC Geography Optional Syllabus	UPSC Geology Optional Syllabus
UPSC History Optional Syllabus	UPSC Law Optional Syllabus	UPSC Maths Optional Syllabus

Other Related UPSC Optional Syllabus		
UPSC Medical Science Optional Syllabus	UPSC Philosophy Optional Syllabus	UPSC Physics Optional Syllabus
UPSC PSIR Optional Syllabus	UPSC Psychology Optional Syllabus	UPSC Sociology Optional Syllabus
UPSC Zoology Optional Syllabus	UPSC Economics Optional Syllabus	UPSC Agriculture Optional Syllabus
UPSC Anthropology Optional Syllabus	UPSC Botany Optional Syllabus	UPSC Chemistry Optional Syllabus
UPSC Civil Engineering Optional Syllabus	UPSC Management Optional Syllabus	UPSC Mechanical Engineering Optional Syllabus
UPSC Public Administration Optional Syllabus	UPSC Statistics Optional Syllabus	UPSC Electrical Engineering Optional Syllabus
UPSC Animal Husbandry & Veterinary Science Optional Syllabus		

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