

Department of Botany

B.Sc. Botany (with Botany as one subject)

Programme Outcomes

PO1. Disciplinary Knowledge: Exposure to the range of plant diversity in terms of structure, function and environmental relationships and its evaluation. Plant classification and identification of plants and the role of plants in the functioning of the global ecosystem.

PO2. Critical thinking: Application of informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

PO3. Problem Solving: Identify the taxonomic position of plants, formulate the taxonomic literature, and analyse reported plants with substantiated conclusions using principles and methods of nomenclature and classification in Botany.

PO4. Research Skills: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information and discussion to provide valid conclusions.

PO5. Additional Academic Knowledge through Digital Literacy: Use of digital skills integrated to enhance understanding of fundamental concepts, execute assignments and standardise protocols for practical.

PO6. Communication skills: Communicate effectively on complex activities with academic community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO7. Team work: Function effectively as a member or leader in teams in multidisciplinary settings. Students will learn team workmanship and develop leadership qualities in order to serve efficiently in institutions, industry and society

PO8. Environment Consciousness: Becomes aware of the role of human activities in nature, significance of importance of sustainable development and its conservation.

PO9. Self- oriented learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO10. Life-long learning: Acquire the skill to be an independent lifelong learner embracing real-time changes in the socio-technological context, promoting continuous development and improvement of the knowledge and skills needed for employment and personal fulfilment

Programme Specific Outcome

PSO1. Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

PSO2. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework.

PSO3. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.

PSO4. Students will be able to explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment.

PSO6. Students will be able to communicate the role of plant in the functioning of global ecosystem.

PSO7. Student will develop the art of analysis and interpretation of data.

PSO8. Student will acquire communication skills and will be able to manage interactions with businesses and organisations

Course Outcome

B.Sc I

CO1- A brief account on general character of Viruses, Bacteriophages, virusoids, viroids, Prions, Cyanophages and Mycorrhiza and its economic importance.

CO2- General characteristic of Bacteria and its economic importance, study of Rhizobium, Azotobacter and Anabena and its role on Microbial biotechnology.

CO3- General account on Fungi, VAM fungi, Parasexuality and Heterothallism and life cycle of various fungi.

CO4- General account on Algae, life cycle pattern of various Algae and study of Gaidukov Phenomena.

CO5- General account of Lichen, Mycoplasma, role of Blue Green Algae and Mushroom Biotechnology.

CO6 - General account on Bryophyta, evolution of its sporophyte its ecological and economical role. Study of anatomy and reproduction of various Bryophyte.

CO7- General account on Pteridophyte, its economical role, Heterospory and seed habit, Stellar system, Apospory and Apogamy, Telome theory and role of *Azolla* as biofertilizers.

CO8- Study of morphology, anatomy and reproductive structure of various Pteridophytes.

CO9- General characters of Gymnosperms its affinity and economic importance and detailed study of *Cycas*, *Pinus* and *Ephedra*.

CO10- An account on Paleobotany and study of some fossil Gymnosperms.

B.Sc II

CO1- Give an account on Characteristic of seed plant with reference to fossil and living seed plants. General account of Gymnosperms its evolution and diversity, and also highlight geological time scale and process of fossilization.

CO2- Detailed study of *Cycas*, *Pinus* and *Ephedra*.

CO3- Origin and evolution of Angiosperm, taxonomy and principles and rules of botanical nomenclature.

CO4- Classification of Angiosperm proposed by Bentham and Hooker and Engler and Prantl and contribution Cytology, Phytochemistry and taxometrics to taxonomy.

CO5- Detailed study of some dicotyledonous and monocotyledonous families.

CO6- Basic body plan of flowering plants, diversity of plant form and evolution of tree habit in Gymnosperm and Angiosperms.

CO7- Vascularisation of shoot system, formation of internodes, Canopy architecture, role of Cambium

CO8- Account on origin, development and arrangement of Leaf, its adaptations, also highlight on Senescence and abscission.

CO9- Embryology of Angiosperms

CO10- Significance of seeds and explain different methods of vegetative propagation.

B.Sc III

CO1- Plant water relations

CO2- Phloem transport, Enzymology, Photosynthesis and Photorespiration.

CO3- Respiration, Nitrogen and Lipid metabolism.

CO4- Growth and development, seed dormancy, germination and plant movements. Photoperiodism, physiology of flowering, Senescence, plant hormone Phytochrome and Cryptochromes.

CO5- Recombinant DNA technology, cloning vectors, genomics, cDNA library, genetic mapping, chromosome walking and concept of Biotechnology and crop biotechnology.

CO6- Environmental factors, its effect on plant and anatomical and physiological response of plants to water, temperature, light and salinity.

CO7- Characteristics of Community, Ecosystem, Biogeochemical cycles and Ecological succession.

CO8- Population ecology, Biogeographical region and types of vegetation in India.

CO9- Economic Botany : food plant , fibre yielding plant, oil yielding plant ,wood and non wood forest plant and its utilization.

CO10- Medicinal and Aromatic plants, rubber plant and plants which provide Beverages.

M.Sc. Botany

Programme Outcomes

PO1. Disciplinary knowledge: Expose students to the diversity amongst plant life forms. Appreciate the highly developed areas of biological sciences with extraordinary position to Botany and its applied branches.

PO2. Critical thinking and Problem Solving: Develop the ability for the application of acquired knowledge in various fields of life so as to make our country self-sufficient. Capability in statistical analyses of data for improved interpretations and problem solving.

PO3: Research Skills: Ability to execute inventive research projects thus enkindling in them the strength of information creation. Consciousness to search the details of life forms at cellular, molecular and nano level.

PO4. Analytical reasoning: Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyse any plant form.

PO5. Experimental Skills: Create, select, and apply appropriate techniques, resources, and use of instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.

PO6. Environment consciousness: Inculcate interest in and love of nature with its myriad living forms. Capacity to create awareness of natural resources and environment and the importance of conserving it. Motivation to distribute the idea of biodiversity conservation.

PO7. Ethical standards: Appreciate and apply ethical principles to biological science research and studies

PO8. Digital literacy: Develop skills in using technology to access, manage, manipulate and create information in an ethical and sustainable way, use information in appropriate ways, and create new ideas and products collaboratively

PO9. Social Interaction: Foster social skills and peer interaction enabling them to make all people feel valued and respect their differences thus creating a socially inclusive society.

PO10. Self- directed Learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO11. Life-long learning: Acquire the skill to be an independent lifelong learner embracing real-time changes in the socio-technological context, promoting continuous development and improvement of the knowledge and skills needed for employment and personal fulfilment

Programme Specific Outcome

PSO1. Develop a clear understanding of subject and its applied branches.

PSO2. Able to execute inventive research project

PSO3. Broaden the outlook on conservation of biodiversity and sustainable use of resources.

PSO4. Capable of self-study and learning from the social environment by acquiring digital skills.

PSO5. Proficient in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

PSO6. Competent to apply fundamental statistics tools and physical principles (physics, chemistry) to the analysis of relevant biological situations

PSO7. Comprehend to physical features of environment, structure of populations, communities, and ecosystems.

PSO8. Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system.

PSO9. Seasoned to apply the scientific method to questions in biology by formulating hypotheses, gathering data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.

Course Outcome

MSc I Semester

Paper I Cytology

CO1- Structure and Function of Cell, Cell Wall and Plasma membrane

CO2- Structure and Function of Cell organelles

CO3- Cell cycle and apoptosis, amitosis, mitosis and meiosis.

CO4- Techniques in cell biology, electron microscope.

Paper II Genetics

CO5- Chromatin organization, specialized type of chromosomes and sex chromosomes

CO6- Mapping of bacteriophage genome, molecular basis of chromosomal pairing.

CO7- Genetic recombination and genetic mapping.

CO8- Plant breeding technique, alien gene transfer through chromosome manipulation.

Paper III Microbiology, Phycology and Mycology

CO9- Archaeobacteria, Eubacteria, Cyanobacteria.

CO10- Viruses, Phytoplasma and Mycoplasma.

CO11- Phycology: classification, account of various members, economic importance, pigmentation, perennation, evolution and development of sex in algae.

CO12- Mycology: Characteristic feature, classification, reproduction. Recent account of all groups. Mycorrhiza: VAM fungus.

Paper IV Bryophyta, Pteridophyta and Gymnosperm

CO13- Bryophyta: General account, progressive sterilization of sporogenous tissue, spore dispersal mechanism, thallus organization, theory of origin and development.

CO14- Pteridophyta: Introduction, homosporous, heterosporous and origin of seed habit, fossil

pteridophyte, prothallus organization.

CO15- Gymnosperm: classification of gymnosperm, affinities gymnosperm, distribution in India, biotechnology, economic importance, structure and theories regarding origin of Paleozoic ovule.

CO16- Extinct gymnosperm, extant gymnosperm.

MSc II Semester

Paper I Taxonomy and Diversity of Plants

CO1- Plant nomenclature, plant identification, taxonomic hierarchy, taxonomic evidences.

CO2- Pre and Post Darwinian classifications, recent modifications, fossil angiosperm.

CO3- Study of dicotyledon families of both polypetalae and gamopetalae

CO4- Study of monoclamydeae and monocotyledon families

Paper II Molecular biology

CO5- RNA and DNA structure, DNA replication .

CO6- Transcription ,translation in prokaryotes and eucaryotes, molecular cytogenetics, restriction mapping, multigene families and their evolution.

CO7- Gene structure and expression, protein sorting.

CO8- Mutation: Types, Mutagens, Mutagenesis, Inherited human disease and defects.

Paper III Plant Physiology

CO9- Membrane transport and translocation of water and solutes

CO10- Signals transduction: G proteins, C-AMP, Calmodulin, Protein kinases, Signaling Mechanisms

CO11- Stress physiology: Mineral nutrition in plants (excess and deficiency).

CO12- Sensory photobiology, the flowering process: Photoperiodism and vernalisation.

Paper IV Plant Metabolism

CO13- Photosynthesis, Photorespiration, Biosynthesis of starch and sucrose, Physiological and ecological considerations.

CO14- Respiration and Lipid metabolism

CO15- Nitrogen and sulphur metabolism

CO16- Plant growth regulators and elicitors, movements in plants, fundamentals of enzymology.

MSc III Semester

Paper I Plant Development and Plant Resources

CO1- Introduction of unique feature of plant development, root development.

CO2- Shoot development, Secretary ducts and laticifers, wood development in relation to environmental factors

CO3- Leaf development, flower development

CO4- Plant resources

Paper II Ecosystem and vegetation ecology

CO5- Ecosystem organization, Biogeochemical cycles

CO6- Ecosystem stability and management, Concept of sustainable development

CO7- Vegetation organization: Concept and analysis of community, coefficients, ecological niche

CO8- Vegetation development: Temporal changes, ecological succession

Paper III Biotechnology and genetic engineering of plants and microbes

CO9- Biotechnology, recombinant DNA technology

CO10- Microbial genetics manipulations, genetic engineering of plants

CO11- DNA synthesis and sequencing

CO12- Genomics and proteomics

Paper IV Elective Course- Molecular Plant Pathology

- CO13- Introduction, history and general principle of plant pathology, disease inciting organisms
- CO14- Diseases syndrome and general symptoms of plant disease, sources of infection, pathogenesis
- CO15- Effect of environment on disease development, host parasitic relationship, physiological specialization
- CO16- Recurrence of disease, methods of studying plant disease

MSc IV sem

Paper I Plant Reproduction and Utilization of Resources

- CO1-Reproduction: Vegetative reproduction, Pollination, Fertilisation
- CO2- Male gametophyte: Microsporogenesis, Pollen germination, allergy storage
Female gametophyte: Ovule, embryosac
- CO3- Seed, Polyembryony, apomixes and fruit development, maturation
- CO4- Utilization of resources, Origin of agriculture, green revolution, ethanobotanical and centre for domesticated plants

Paper II Pollution and Biodiversity Conservation

- CO5- Climate, soil and vegetation pattern of the world
- CO6- Pollution, climate change and ecosystems
- CO7- Biological diversity, biodiversity hotspots, IUCN categories of threat
- CO8- Conservation strategies: Insitu and exsitu conservation

Paper III Plant cell, tissue culture and organ culture

- CO9- Plant cell and tissue culture, clonal propagation, organogenesis
- CO10- Somatic embryogenesis, androgenesis and somatic hybridization
- CO11- Cryopreservation and germplasm storage, intellectual property rights
- CO12- Application of plant tissue culture, production of secondary metabolites/natural products, transgenics in crop improvement

Paper IV Elective Paper- Molecular Plant Pathology

- CO13- Epidemiology and disease forecasting, general principle of plant disease control.
- CO14- Defense mechanism, resistant and susceptibility.
- CO15- Wilt disease, disease due to fungi, disease due to bacteria
- CO16- Disease due to viruses, mycoplasma and nematodes.