# PO M. Sc (Biological Sciences/ Life Sciences)

The following Departments are included under Biological Sciences/Life Sciences:

- Botany
- Biotechnology
- Biochemistry
- Zoology

PO1. Courses offered in the Biological Sciences/ Life sciences give students a general understanding of the fundamental principles of life that extend from the tiniest microbes to plants, animals, and human beings.

PO2. Students can describe the structure and function of cellular components and explain how they interact in a living cell. They can also describe how cells interact to develop tissues and organs, and how these contribute to a functional organism.

PO3. Students can demonstrate an understanding of the mechanisms driving evolution, and can describe similarities and differences of the major taxonomic groups.

PO4. Students will become proficient in handling relevant scientific instruments and have a understanding of the principles of working.

PO5. Students can formally communicate the results of biological investigations using both oral and written communication skills.

PO6. Students also obtain the knowledge, skills, and motivation necessary to lifelong learning and problem solving attitude.

PO7. Specialized courses emphasizing teaching and research in various life science disciplines are also offered. Disciplines range from basic science to applied science.

# PSO M. Sc (BOTANY)

PSO 1. Students will be able to identify the major plant groups and be able to classify them within a phylogenetic framework

PSO 2. Students will be able to evaluate and distinguish between the various plant groups that differentiate them from each other and also from other forms of life

PSO 3. Students will to able to comprehend the principles of plant systematics, nomenclature and characteristic features of some important families of flowering plants with special reference to their evolutionary trends.

PSO 4. Students will be able to elucidate plant functions at the level of the molecule, gene, genome, cell, tissue, organ and organ-system. This would help them understand specific examples of the physiological adaptations, development and reproduction.

PSO 5. Students will be able to spell out the ecological interconnectedness of life by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of communities, and ecosystems.

PSO 6. Students will be able to demonstrate proficiency in the experimental techniques for their area of specialization within Molecular Biology and Plant Biotechnology.

PSO 7. Students will develop the proficiency in handling Bioinformatics software and understanding their applications.

PSO 8. Students will cultivate the skill of collecting and analyzing information from various sources and interpreting them in form of experiments thus developing the habit of working independently.

PSO 9. Students will develop the capacity of critical thinking and problem solving aptitude by virtue of taking research assignments.

PSO 10. Students will develop communication and articulation skills by taking up curricular and curricular based extension assignment.

# CO M.Sc. BOTANY

CO1. Understanding of general microbiology, contribution of scientists, ultra structure, morphology and reproduction of Bacteria, Virus and Archaebacteria, Cyanobacteria; Economic Importance; General character and recent classification of algae, their distribution, ultrastructre, reproduction and economic uses; General account of Mycology, classification, evolutionary trend and Plant pathology with respect to symptomology, histopathology, etiology and identification of diseases.
Students will also gain a practical exposure to every topic enumerated.

CO2. Understanding of general characters, distribution, classification, ecology, fossil history cytology and evolution of sporophytes in Bryophyta; General Characters of pteridophytic classes, distribution, classification, contribution of Indian pteridologists, evolutionary trends in Pteridophytes.
Students will also gain a practical exposure to every topic enumerated

CO3. Understanding of plant fossils, their preservation, age determination, Geological time scale, reconstruction and nomenclature and applied aspect of Paleobotany. General account of distribution, origin, system of classification, comparative morphology and evolutionary tendencies of certain fossil members of Gymnosperm, and general characters of living gymnosperm, embryology, phylogeny and evolution of ovuliferous scale.
Students will also gain a practical exposure to every topic enumerated.

CO4. Comprehension of Cytology and genetics with reference to Mendel's law of inheritance, linkage, chromosome theory of inheritance, multiple genes, sex determination in plants *Drosophila* and *C. elegans*; Cytoplasmic inheritance and maternal effects, structural and numerical changes in chromosomes, origin and breeding behavior of structural heterozygotes, population genetics, spontaneous and induced mutation their causes and consequences and use in crop improvement, Introduction to epigenetics.
Students will also gain a practical exposure to every topic enumerated.

CO5. To understand plant physiology, photosynthesis, respiration, plant hormone, sensory photobiology; Nomenclature classification and kinetics of enzymes; Mechanism of Solute and photo assimilate transportation; metabolism of carbohydrate, lipid, protein, amino acids, nitrogen and study of secondary metabolites.
Students will also gain a practical exposure to every topic enumerated

CO6. Introduction to plant development at molecular level, plant growth kinetics and patterns of growth. Organization of shoot apical meristem (SAM); cytological and molecular analysis of SAM, Leaf growth and differentiation, Organization of root apical meristem (RAM); vascular tissue differentiation; lateral root hairs; root microbe interactions. Physiology of flowering, Genetics of floral organ differentiation; homeotic mutants in *Arabidopsis* and *Antirrhinum*. Reproduction and gametophyte development in angiosperm, pollen pistil interaction. Seed Development and fruit growth, Basic concepts of Senescence and Programmed Cell Death (PCD)
Students will also gain a practical exposure to every topic enumerated.

CO7. Insight into ultra structure and function of Cell wall, Plasma membrane, Plasmodesmata. Cellular organelles like golgi complex, lysosomes, peroxisomes, endoplasmic reticulum, mitochondria, chloroplast and plant vacuoles. Cell shape and motility, Ultra structure of nucleus, nuclear pores, nucleolus, DNA structure A, B and Z forms, replication in prokaryotic and eukaryotic cells, damage and repair. Understanding of Stress biology, biotic stress, HR and SAR, production of ROS, induction of enzymes; PR proteins; R-genes, abiotic stress.
Students will also gain a practical exposure to every topic enumerated

CO8. Understanding of flower Morphology of Angiosperm, origin and evolution of stamen, carpels; placentation types. Floral adaptation to different pollinators; principles and historical development of angiosperm taxonomy, merits and demerits of major systems of classifications. Taxonomic hierarchy; heterobathamy, analytic versus synthetic character, qualitative versus quantitative characters; Taxonomic evidences and tools, Biosystematics and Ethno-botany.
Students will also gain a practical exposure to every topic enumerated

CO9. Comprehending of Vegetation organization, concepts of community and continuum, Vegetation development, Community function- Dynamics and succession, General introduction to autecology. Ecosystem organization, Structure and functions; Ecosystem stability, Ecological perturbations (natural and anthropogenic), ecology of plant invasion; environmental impact assessment; ecosystem restoration. Concepts of ecological management. General account of IUCN, Red Data Book, Protected areas, Biosphere reserves. Wetlands and Mangroves Coral Reefs. Botanical gardens, Seed Banks; In-vitro repositories, Cryobanks.
Students will also gain a practical exposure to every topic enumerated

CO10. Perception of distinguishing characters, floral variation and evolution, affinities of angiospermic classess viz., Magnolidae, Hamamelidae, Dilleniidae, Rosidae, Asteridae, Alismatidae, commelinidae, Aracidae, Lilidae;

Interesting features and systematic position of Cucurbitaceae, Cactaceae, Asteraceae, Amentiferae, Lemnaceae, Palmae, Orchidaceae. Angiospermic ancestry,speciation and extinction. Concepts of Biological diversity and Endemism.
Students will also gain a practical exposure to every topic enumerated

CO11. Understanding of DNA replication in prokaryotes and eukaryotes. DNA damage and repair, Gene expression and regulation. Tools of rDNA technology, Recombinant DNA libraries, molecular probing. Splicing of foreign DNA into cloning vector and study of various vector related techniques. Applications of PCR in molecular biology.
Students will also gain a practical exposure to every topic enumerated

CO12. Insight into climate, vegetation, floristic region of the world and Phytogeographical regions of India; Endemism, Forest types of India; Garden Design, Components of garden; Garden Features and Ornamentation, Nursery production and management, Propagation of ornamental plants, Plant disorders, Ornamental ferns and their propagation, Introduction to landscaping design and polyhouse technology.
Students will also gain a practical exposure to every topic enumerated

CO13. Comprehension of Structure and function of Ribosome, Transcription, Translation; Fine structure of gene, Protein sorting; Genome organization in prokaryotes and eukaryotic organelles; Genetic recombination and mapping; Cell cycle and apoptosis, specific signaling, Sucrose sensing mechanism, techniques in cell Biology.
Students will also gain a practical exposure to every topic enumerated.

CO14. Understanding the concept on recombinant DNA technology; Genetic engineering of plants; Microbial genetic manipulation; Genomics and proteomics, Molecular markers for introgression of useful traits; high throughput sequencing; functional genomics; Protein profiling and its significance, DNA synthesis; DNA sequencing; applications of PCR; DNA fingerprinting. Plant tissue culture, transgenic production in plants; History, Definition and applications of bioinformatics; and basic concept of Plant breeding.
Students will also gain a practical exposure to every topic enumerated

CO15. Knowledge of Entrepreneurship in Botany, Phytochemistry, Cultivation of common medicinal herbs; Gardening, silviculture and Post harvesting techniques; Floriculture; Culture techniques of- Mushroom culture, *Spirulina* cultivation, compost, vermi-composting, biofertilizer production, hydroponics, plant tissue culture, techniques to increase shelf-life of ornamental plants.
Students will also gain a practical exposure to every topic enumerated

CO16. Transgenic plants, *Agrobacterium* mediated and direct DNA transfer, transformation of monocots; transgene stability and gene silencing; chloroplast transformation. Applications of transformation; Transgenics and molecular farming; Plant tissue culture; DNA fingerprinting and marker assisted breeding; Cleaner Biotechnology, pollution control through genetically modified organisms.
Students will also gain a practical exposure to every topic enumerated

**Credits:**

1 Theory period of one hour per week over a semester
2 Tutorial period of one hour per week over a semester
1 practical period of two hour per week over a semester

**Total number of Credits per semester is 25**