

Program: M.Sc. Botany

Programme Specific Outcome:

- PSO1. Maintain a high level of scientific excellence in botanical research with specific emphasis on the role of plants. Create, select and apply appropriate techniques, resources and modern technology in multidisciplinary way. Practice of subject with knowledge to design experiments, analyze and interpret data to reach to an effective conclusion.
- PSO2. They would identify, formulate and analyze the complex problems with reaching a substantiated conclusion. Logical thinking with application of biological, physical and chemical sciences. Learning that develops analytical and integrative problem-solving approaches.
- PSO3. Students would perform functions that demand higher competence in national/international organizations with sporty spirits and helping each other.
- PSO4. Student should be aware of ethical issues and regulatory considerations while addressing society needs for growth with honesty.
- PSO5. Best problem-solving skills in students would encourage them to carry out innovative research projects thereby making them to use knowledge creation in depth.
- PSO6. They would lend the support to other students to grow with them with equal opportunities.
- PSO7. Knowledgeable disciplined students with good values, ethics, kind heart will help in nation building globally.

Course Outcomes

Semester-I

Course: Cell Biology

- CO1. The Student will be able to categorize and classify structural organization and function of intracellular organelles, structure of atoms, molecules and to chemical bonds and Composition, structure and function of biomolecules
- CO2. The student will be able to determine the Principles, magnification, resolving power and working of Light microscope, Phase contrast microscope; Confocal microscope; Electron microscopes (EM)- SEM, TEM and STEM, Fluorescence microscopes.
- CO3. The students will come outline and differentiate the conformation studies of proteins and nucleic acids.
- CO4. The student will be able to examine and recognize the physiology and metabolism of cell.
- CO5. The student will be able to determine the ultrastructure of various organelles of cell and their function.
- CO6. The student will be able to analyze and determine the cell cycle (mitosis, meiosis) and their control.

Course: Cytogenetics

- CO1. To Learn about Mendelian principles, gene mapping methods and Extra chromosomal inheritance.
- CO2. To know about structure of special types of chromosomes like lampbrush, polytene, B-chromosomes and sex chromosomes
- CO3. To know about the graphic representation of human being chromosomes by karyotype and idiogram.
- CO4. To gain the knowledge about various types of Structural alterations in chromosomes, like duplications, deficiencies, inversions and translocation and their effect to organisms.
- CO5. The student will be able to distinguish and analyze Evolution and Emergence of evolutionary thought
- CO6. The student will be able to determine and examine the basics of Population genetics.

Course: Molecular Biology

- CO1. This will enhance the student to classify, compare and distinguish various macromolecules their classification, structure and function of carbohydrates (Polysaccharides, mucopolysaccharides, mucoproteins and glycoproteins), lipids.
- CO2. The student will be able to classify, determine the structure and function of protein.
- CO3. To recognize and determine about genetic material of an organism and its functions
- CO4. The student will be able to distinguish and analyze the process of replication prokaryotes as well as eukaryotes.
- CO5. To interpret and relate processes of transcription, translation and its regulation.
- CO6. Study of regulation of gene expression by different models

Course: Biology and Diversity of Viruses, bacteria and fungi

- CO1. The student will be able to classification, characteristics, ultra-structure of Prokaryotic and Eukaryotic microbes
- CO2. The student will be able to Know about organisms and causal factor responsible for plant diseases and methods of studying plant diseases.
- CO3. The student will be able to Familiarize with some common plant diseases of India
- CO4. The student will be able to Gain knowledge on Host parasite interaction process.
- CO5. The student will be able to know about structure, classification and distribution of these microbe
- CO6. The student will be able to gain knowledge about economic as well as medicinal importance of viruses, bacteria and fungi

Course: Biology and Diversity of Algae and Fungi

- CO1. The student will be able to categorize and relate the comparative account of various algal divisions
- CO2. The student will be able to determine the occurrence, distribution, structure and life

- history of lower plants such as algae and bryophytes.
- CO3. The student will be able to determine, categorize and examine the phylogeny and evolutionary concepts in lower group of organisms.
 - CO4. The student will be able to recognize the economic importance of both groups.
 - CO5. The student will be able to Determine the morphological as well as anatomical features of these groups

Semester-II

Course: Biology and Diversity of Pteridophytes and gymnosperms

- CO1. The student will be able to Study, occurrence, classification, distribution, structure and life history of pteridophytes and gymnosperms
- CO2. The student will be able to determine and recognize the role of fossil in oil exploration and coal excavation, study of paleopalynology.
- CO3. The student will be able to examine the economic importance of gymnosperms and pteridophytes.
- CO4. The student will be able to determine the different origin, characters and evolution of different classes of pteridophytes and gymnosperms.
- CO5. The student will be able to interpret the different fossil types, classification and occurrence of pteridophytes

Course: Taxonomy of Angiosperms

- CO1. The student will be able to determine and categorize the system of classification of higher plants with merits and demerits
- CO2. The student will be able to examine and analyze the methods of plant Identification and its uses.
- CO3. The student will be able to recognize and distinguish about the National and International Herbaria and Botanical gardens
- CO4. The student will be able to determine, categorize and recognize families and their economic importance.
- CO5. The student will be able to analyze the importance of various floral characters of plants, floral formula and floral diagram.
- CO6. The student will be able to conclude and classify the fruit structure, types and their chemical composition.

Course: Plant Physiology and Metabolism

- CO1. The student will be able to know and interpret the requirement of mineral nutrition for plant growth
- CO2. The student will be able to generalize the process of Photosynthesis, Respiration and Nitrogen metabolism
- CO3. The student will be able to extrapolate mechanisms related to Sensory

- photobiology
- CO4. The student will be able to compare classify the Plant Growth hormones (Auxins, Gibberellins. Cytokinins, Ethylene) and their effects.
 - CO5. The student will be able to Examine and determine the biosynthesis of terpenes, phenols and nitrogenous compounds
 - CO6. The student will be able to interpret the Stress physiology – Responses of plants to biotic and abiotic stresses

Course:Forest Botany

- CO1. The student will be able to determine and categorize the various types of forests in India, their distribution and importance to human beings.
- CO2. The student will be able to determine and analyze the composition and cell types of wood
- CO3. The student will be able to determine and examine growth rings, annual rings, dendrochronology, aerial photography, remote sensing and geography information system of forests.
- CO4. The student will be able to determine and analyze the commercial value of timber, fuel wood, pulp and paper making, match –stick wood, plywood and economic importance of pulp and woodspecies.
- CO5. The student will be able to recognize and analyze the laws related to forest management, village forest management committees, National forest policy.
- CO6. The student will be able to examine and interpret the various types of wood decay, their symptoms and management.

Course:Molecular Genetics

- CO1. The student will be able to deals with vast study of chromosomes, genes, genetic material of both prokaryotes and eukaryotes.
- CO2. The student will be able to Learn about the DNA damage and repair mechanisms, RNA synthesis and processing
- CO3. The student will be able to Know about Protein synthesis and processing, Control of gene expression
- CO4. The student will be able to learn about various types of mutation, its types and effect to an organism.
- CO5. The student will be able to It deals with the molecular mechanism of genetic recombination, crossing over and independent assortment.
- CO6. The student will be able to Understand about the gene mapping, restriction mapping, gene jumping and gene walking.

Semester-III

Course:Plant Development

- CO1. The student will be able to analyze and determine the plant cells, tissues and their functions.
- CO2. The student will be able to differentiate and distinguish between plant anatomy and the other major disciplines of biology.
- CO3. The student will be able to identify and compare structural differences among different taxa of vascular plants.
- CO4. The student will be able to determine the structure and development of monocot and dicot embryos.
- CO5. The student will be able to analyze and predict the function and morphology of pollen grains.

Course:Plant Reproduction

- CO1. The student will be able to Compare and contrast the life cycles of angiosperms (flowering plants), gymnosperms (conifers), non-seed vascular plants (ferns), and nonvascular plants (mosses)
- CO2. The student will be able to determine and distinguish and recognize the structures and functions of the flower, seed, and fruit in the angiosperm life cycle
- CO3. The student will be able to determine and predict the process, locations, and significance of angiosperm gametogenesis and fertilization, including double fertilization
- CO4. The student will be able to Explain the process and significance of seed maturation, dormancy, and germination
- CO5. The student will be able to determine and Predict mechanisms of pollination based on flower characteristics and dispersal based on fruit characteristics.

Course:Plant Ecology: Principles and concepts

- CO1. The student will be able to analyze and generalize the plants life history and functional traits, demography, and interactions between plants, between plants and animals and between plants and the remaining ecosystem.
- CO2. The student will be able to determine and recognize the followings
 - a)Life history and reproduction strategies (incl. seed and pollination ecology)
 - b)Functional traits on population, community and landscape level
 - c)Interactions between plants and the abiotic and biotic environment
 - d)Diversity and distribution
 - e)Restoration of plant communities
 - f)Conservation of plants and plant communities
 - g)Plants and climate change
- CO3. The student will be able to analyze the current theories, methods and interpretations within the field plant ecology, and work independently with practical and theoretical

problem solving with respect to plant responses in terms of functional traits, life history, demography and ecosystem interactions in different ecosystems.

Course:Plant Resource utilization

- CO1. The student will be able to determine and recognize the fundamental to agricultural production and food security, as well as a valuable constituent of environmental conservation have been clearly observed.
- CO2. The student will be able to determine and recognize the Origin of Cultivated Plants, centers of origin, Classification of plant resources on the basis of their uses Leguminous plant resources.
- CO3. The student will be able to distinguish determine the beverages sources, products and uses; Spices and condiments: Sources and uses, fibers, Fruits, Timber and non-timber plant resources medicinal plants
- CO4. The student will be able to recognize and determine the Pharmacognosy and its importance in medicinal plant uses.

Course:Agriculture Botany

- CO1. The student will determine and analyze the origin of crops and genetic resources
- CO2. The student will be able to recognize the morphology, reproductive biology, cultivation practices, cytology and genomic analysis of important crops of Punjab.
- CO3. The student will be abler to determine the scope and role of biotechnology in crop breeding.
- CO4. The student will be able to determine and analyze the important diseases, their symptoms and disease cycle and their histopathology among the important crops of Punjab.

Semester-IV

Course:Phytogeography and Applied Ecology

- CO1. The student will be able to determine and distinguish the scope and importance of the discipline.
- CO2. The student will be able to extrapolate and Understand plant communities and ecological adaptations in plants.
- CO3. The student will be able to distinguish and categorize conservation of biodiversity, Nonconventional Energy and Pollution.
- CO4. The student will be able to predict and analyze botanical regions of India and vegetation types of Punjab.
- CO5. The student will be able to analyze the current theories, methods and interpretations within the field plant ecology, functional traits, life history, demography and ecosystem interactions in different ecosystems.

Course:Plant Diversity and Conservation

- CO1. The student will be able to generalize the Conservation Biology major is designed to provide students with a broad scientific background in preparation for a career or graduate study in conservation fields, but with a specific focus on biodiversity science.
- CO2. The student will be able to acquire a knowledge of the issues and problems of sustainable resource usage, conservation of endangered biota, long-term preservation of biodiversity, ecosystem services and ecological economics, and management and conservation of ecosystems.
- CO3. The student will be able to determine and analyze a variety of areas of biology, especially conservation biology.
- CO4. The student will be able to determine and predict the preparation for work with Non-Government Organizations (NGOs) and for positions in government agencies (e.g. US Fish & Wildlife Service, Bureau of Land Management, National Park Service, National Oceanic and Atmospheric Administration, and state fish & game agencies).

Course:Basic Research Techniques

- CO1. The student will learn and determine the basic principles and safety measures to be followed.
- CO2. The student will determine and analyze the basic cell culture, anatomical and histochemical techniques and principle and methods of histochemical localization.
- CO3. The student will determine and learn about principle, functioning, applications and types of centrifugation, spectroscopy, electrophoresis and chromatography.

Course: Biotechnology and Genetic Engg.

- CO1. The student will be able to determine and distinguish the fundamentals of totipotency plant tissue culture techniques.
- CO2. The student will be able to determine the transgenic technology for the improvement of quality and quantity of plant and thereby product.
- CO3. The student will be able to evaluate and distinguish the advantages of in vitro propagation in various areas.
- CO4. The student will be able to recognize and determine the application and importance of plant tissue culture and transgenic plants.

Course:Plant Cell, Tissue and Organ Culture

- CO1. The student will be able to determine the plant tissue culture techniques and their application and to distinguish transgenic plants as well as its industrial and agricultural applications

CO2. The student will be able to determine and distinguish in vitro methods. Plant genetic transformation (Direct and indirect methods). Regeneration methodologies and recovery of transgenics.