

GOVERNMENT GENERAL DEGREE COLLEGE, NARAYANGARH

PROGRAMME OUTCOME (PO)

&

COURSE OUTCOME (CO)

(Based on Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2023 & NEP, 2020)

DEPARTMENT OF BOTANY

B. SC. IN BOTANY AS MINOR

(From Academic Session 2023-2024)

PROGRAMME OUTCOME (PO)

Programme Outcomes are as follows: -

- 1. Acquire detailed knowledge of microorganisms, including viruses, bacteria, algae, fungi, and their economic significance, as well as an understanding of plant groups such as Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms.
- 2. Develop practical skills through laboratory techniques and fieldwork, including microscopy, staining, and specimen analysis of various microorganisms and plants.
- 3. Apply knowledge of plant morphology, anatomy, classification, and reproductive processes to real-world problems in agriculture, horticulture, and conservation.
- 4. Comprehend the ecological roles and economic importance of microorganisms and plants, including their applications in agriculture, industry, and environmental sustainability.
- 5. Gain expertise in the use and management of biofertilizers, organic farming practices, and the role of microorganisms in soil fertility and plant growth.
- 6. Acquire skills in floriculture, including nursery management, ornamental plant cultivation, garden design, and commercial flower production.

B. SC. IN BOTANY AS MINOR

(From Academic Session 2023-2024)

PROGRAMME SPECIFIC OUTCOME (PO)

- 1. Understand the discovery, structural features, replication processes, and economic significance of microorganisms, including viruses, bacteria, algae, and fungi.
- 2. Acquire knowledge of plant morphology, classification, and reproductive processes, including detailed studies of Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms.
- 3. Develop practical skills through laboratory and fieldwork, including microscopy, staining techniques, and the study of plant and microorganism structures.
- 4. Learn about the production and application of biofertilizers, organic farming practices, and the role of microorganisms in enhancing soil fertility and plant growth.
- 5. Gain expertise in floriculture and landscape gardening, including plant propagation, garden design, and the cultivation of ornamental plants.
- 6. Understand the ecological roles and economic importance of microorganisms and plants, and their applications in various industries.

B. SC. IN BOTANY AS MINOR

(From Academic Session 2023-2024)

COURSE OUTCOME (CO)

SEMESTER -I

MI – 1T: Plant Science-I

- **CO1:** Understand and describe the Whittaker's five-kingdom system of classification, including the general characteristics and classification (Baltimore) of viruses, and their economic importance. Identify general characteristics and classifications of bacteria (Bergey's Classification) and their economic relevance. Recognize the general characteristics, habitat, classification (Van Den Hoek, 1995), and life cycle patterns of algae (e.g., Volvox and Batrachospermum) and fungi (e.g., Rhizopus and Agaricus), including their economic importance and a brief overview of lichen and mycorrhiza.
- **CO2:** Analyze and explain the general characteristics, classification (Proskauer, 1957), morphology, anatomy, and reproduction of bryophytes, specifically Riccia, Anthoceros, and Funaria. Understand their economic importance. Identify the general characteristics, classification (Sporne, 1975), morphology, anatomy, and reproduction of pteridophytes, particularly Lycopodium, Adiantum, and Marsilea, and their economic significance.
- **CO3:** Describe the general characteristics, classification (Sporne, 1965), morphology, anatomy, and reproduction of gymnosperms, focusing on Cycas and Pinus, and their economic importance. Understand the geological time scale, significant events in paleobotany, and the types of plant fossils (impressions, compressions, petrifactions).

MI – 1P: Plant Science-I (Practical)

- **CO1:** Analyze and interpret electron micrographs and models of viruses such as T-Phage and SARS-CoV2 to understand their structural features.
- **CO2:** Identify and differentiate curd organisms using Gram staining techniques, and understand their classification and characteristics.
- **CO3:** Examine and describe the vegetative and reproductive structures of Volvox and Batrachospermum, focusing on their morphology and life cycles.

- **CO4:** Study the morphology and reproductive structures of Rhizopus and Agaricus, and understand their role in fungal biology.
- **CO5:** Investigate the morphology of the thallus and reproductive structures of Riccia, Anthoceros, and Funaria, and identify their key features.
- **CO6:** Analyze the vegetative and reproductive structures of Lycopodium, Adiantum, and Marsilea, understanding their developmental and ecological aspects.
- **CO7:** Study the morphology and vegetative structure of Cycas and Pinus, focusing on their classification and adaptation.
- **CO8:** Identify and differentiate types of plant fossils including impressions, compressions, and petrifactions, and understand their significance in paleobotany.

SEC1P: Biofertilizers

CO1: Understand the role and applications of Rhizobium as a biofertilizer, including techniques for isolation, identification, and mass multiplication, as well as carrier-based inoculants and Actinorrhizal symbiosis.

CO2: Isolate and multiply Azospirillum and Azotobacter, and comprehend their characteristics and effects on crop growth, including methods for maintaining and utilizing these microorganisms as inoculants.

CO3: Explore the role of cyanobacteria, Azolla, and Anabaena azollae in nitrogen fixation, including factors affecting their growth and their applications in rice cultivation.

CO4: Identify and understand different types of mycorrhizal associations, including their taxonomy, distribution, and role in phosphorus nutrition, as well as methods for isolating and producing VAM inoculants for enhancing crop growth and yield.

CO5: Implement organic farming practices, including green manuring, organic fertilizers, and waste recycling methods such as biocomposting and vermicomposting, with a focus on their field applications.

SEMESTER -II

MI-2T: Plant Science II

- **CO1:** Describe the general characteristics of root, stem, and leaf structures in monocots and dicots, including phyllotaxy.
- **CO2:** Identify and differentiate between types of inflorescences, understand aestivation and placentation, and construct floral formulas and diagrams.
- **CO3:** Classify various types of fruits and seeds, understanding their structural and functional roles.
- **CO4:** Analyze the three tissue systems and primary structures of root, stem, and leaf, including types of stomata, vascular bundles, and secondary growth patterns such as sapwood, heartwood, and annual rings.
- **CO5:** Understand the significance of plant systematics, the role and functions of herbaria, and the concepts related to flora, monographs, and taxonomic keys.
- **CO6:** Explain taxonomic hierarchy, concepts of taxa, species concepts, and the principles and rules of botanical nomenclature according to ICN.
- **CO7:** Compare artificial, natural, and phylogenetic classification systems, including the Bentham and Hooker system and Angiosperm Phylogeny Group classification, and understand the concepts of primitive and advanced angiosperms.
- **CO8:** Provide general descriptions and classifications for the plant families Malvaceae, Papilionaceae, Acanthaceae, Verbenaceae, Asteraceae, and Poaceae, focusing on their morphological and ecological characteristics.

MI-2P: Plant Science II (Practical)

- **CO1:** Identify and differentiate between simple and compound leaf types through detailed observation and analysis.
- **CO2:** Distinguish between recemose and cymose types of inflorescences and understand their structural variations.
- **CO3:** Analyze floral diversity with a focus on adhesion and cohesion mechanisms in various plant species.
- **CO4:** Classify different types of fruits including berries, drupes, hesperidiums, and nuts, with examples such as Cucumis sativus and Mangifera indica, and understand

their structural characteristics.

• **CO5:** Examine and compare vegetative and floral characters of plant families such as Malvaceae, Acanthaceae, Papilionaceae, and Verbenaceae, using specimens like Sida sp., Ruellia sp., and Tephrosia sp.

SEC 2P: Floriculture

- **CO1:** Understand the historical development of gardening and the significance of floriculture and landscape gardening.
- **CO2:** Apply techniques for nursery management and routine garden operations, including propagation methods, soil sterilization, and various plant care practices such as sowing, pricking, and transplanting.
- **CO3:** Identify and cultivate a range of ornamental plants, including flowering annuals, herbaceous perennials, vines, shade trees, and indoor plants, and understand their specific care requirements.
- **CO4:** Design and implement various styles of garden layouts, including English, Italian, French, Persian, Mughal, and Japanese gardens, incorporating essential garden features and elements.
- **CO5:** Plan and execute landscaping projects for public spaces such as highways and educational institutions, considering both aesthetic and functional aspects.
- **CO6:** Manage commercial floriculture practices including flower production, packaging, arrangement, and methods to prolong vase life, with a focus on key cut flowers.
- **CO7:** Diagnose and manage diseases and pests affecting ornamental plants, implementing effective control measures to maintain plant health.