



PARIMAL MITRA SMRITI MAHAVIDYALAYA

Affiliated to: University of North Bengal
Government aided co education degree colleges

DEPARTMENT OF BOTANY

PROGRAM OUTCOME

- ❖ Graduates from Botany programs will acquire a deep and comprehensive grasp of various aspects of plant science, encompassing plant anatomy, morphology, taxonomy, physiology, embryology, and ecology.
- ❖ They will develop proficiency in identifying and categorizing plant species, utilizing taxonomic keys for identification, thereby facilitating careers in fields like forestry.
- ❖ Equipped with essential research skills, they'll be capable of conducting experiments, gathering data, analyzing findings, and drawing conclusions across diverse botanical realms.
- ❖ The curriculum will instill environmental consciousness in students, fostering an appreciation for the diverse roles different plant groups play in ecosystem balance.
- ❖ Graduates will recognize the practical implications of botanical knowledge in domains such as agriculture, horticulture, forestry, conservation, biotechnology, pharmaceuticals, and bioenergy, offering pathways into environmental fields, forensic sciences, bio-entrepreneurship, and pharmaceutical industries.
- ❖ They'll possess effective communication skills to convey scientific concepts and discoveries through oral presentations, written reports, and scientific publications, ultimately leading to positive and forward-thinking outcomes for the Botany course.

SEMESTER- I		
Course Code	Course Name	Course Outcome
DSC1	PAPER 1 Biodiversity (Microbes, Algae, Fungi and Archegoniate)	Theory: ➤ Biodiversity holds significant importance in everyone's life, especially for science students who must thoroughly understand and appreciate its value. This course aims to cultivate a deeper appreciation for nature among the younger generation. ➤ Delving into the microbial realm, including bacteria and viruses, and their environmental impacts will foster a heightened understanding and appreciation for these organisms. ➤ Similarly, the study of lower plants such as algae, fungi, bryophytes, pteridophytes, and gymnosperms, often overlooked, will reveal their ecological importance, sparking a newfound interest in this plant group. ➤ Exploring the morphology, anatomy, and reproduction of these plants will establish a foundational knowledge of plant diversity, economic significance, and taxonomy within the lower plant groups. ➤ Some students may be inspired to pursue further exploration of these topics, potentially contributing to the propagation and conservation efforts in the future. Practical: ➤ Practical training sessions will equip students with skills in microscope usage, sample preparation techniques such as mounting, section-cutting, and staining for plant material analysis. ➤ Drawing exercises in lab reports will deepen comprehension of morphological and structural features, alongside their functional significance across various plant categories. ➤ Utilizing visual aids like photographs, charts, and permanent slides, along with direct observation of specimens under the microscope, will provide students with a clearer understanding of lower plant groups, potentially igniting their interest for further study in this area.

SEMESTER- II		
Course Code	Course Name	Course Outcomes
DSC 1	PAPER 2: Plant Ecology and Taxonomy	Theory- ➤ Upon completion of the course, students will gain a comprehensive understanding of biodiversity's crucial role in sustaining diverse ecosystems. ➤ They will recognize the importance of each species in maintaining ecological balance and the potential disruption caused by the loss of even a single species. ➤ Students will grasp the inter connectedness of living organisms with their environment, emphasizing the necessity of continuous cycling of elements for ecosystem functioning. ➤ Exploring the distribution of plants across various habitats and regions, including endemic species, will inspire further study and fascination with plant adaptation. ➤ Taxonomy, fundamental to the sciences, will be thoroughly covered, providing students with essential skills from identification rules to scientific nomenclature and herbarium study. ➤ This comprehensive approach will spark curiosity and interest among students, potentially leading them to pursue careers or research in forestry and environmental sciences. Practicals- ➤ Students will gain proficiency in utilizing a variety of instruments such as soil thermometers, anemometers, rain gauges, and lux meters. ➤ They will learn techniques for pH determination and conducting rapid field tests to analyze soil samples for various components including carbonates, chlorides, and organic matter. ➤ Morphological adaptations of hydrophytes and xerophytes will be studied, providing insight into plant adaptations to water-rich and arid environments. ➤ Using the species-area curve method, students will determine the minimal quadrat size needed to study herbaceous vegetation on the college campus. ➤ Procedures for collecting herbarium specimens, preparing herbarium sheets, dissecting specimens, and drawing floral diagrams will be covered comprehensively.

SEMESTER- III		
Course Code	Course Name	Course Outcomes
DSC 1	PAPER 3: Plant Anatomy and Embryology	Theory- ➤ Understanding plants requires more than just morphological examination; an in-depth anatomical study of various plant parts is essential for a comprehensive understanding. ➤ Exploring different types of tissues encourages students to think at a cellular level and comprehend the internal workings of plant systems, particularly in relation to adaptation to diverse habitats. ➤ The process of secondary growth, driven by cambium activity and resulting in various types of wood formation, offers insight into tree age determination, fostering students' enthusiasm for further exploration in this field. ➤ This course clarifies the reproductive role of flowers in plants and their significance in plant propagation. ➤ Detailed exploration of flower anatomy, pollination, fertilization mechanisms, and seed formation enhances students' understanding of plant life sustainability. ➤ Topics such as apomixis and polyembryony, along with their practical applications, may inspire students to pursue subjects like floriculture in the future. Practicals- ➤ Students will enhance their microscope skills for examining various plant tissues, improving their ability to distinguish between dicot and monocot anatomical features. ➤ They will gain insight into the anatomical adaptations of hydrophytes and xerophytes, deepening their understanding of plant adaptation to different environments. ➤ Detailed examination of structures such as anthers, various types of ovules, and embryo sacs will provide students with a comprehensive understanding of plant reproductive anatomy. ➤ Viewing electron micrographs of mature egg apparatus cells will offer students a clearer understanding of theoretical concepts through ultrastructural analysis.

SEMESTER- IV		
Course Code	Course Name	Course Outcomes
DSC1	PAPER 4 Plant Physiology and Metabolism	Theory- ➤ Students will learn about the intricate relationship between plants and water, as well as the diverse mechanisms involved in nutrient and water transport within the plant. ➤ They will gain a deeper understanding of vital physiological processes like photosynthesis and respiration, which are fundamental to ecosystem sustainability, including exploration of different pathways associated with these processes. ➤ This unit focuses on metabolic processes related to the assimilation of metabolites in plants, providing insight into metabolism concepts, synthesis, and assimilation mechanisms through specific pathways and regulatory mechanisms. ➤ Through detailed examination of enzymes, including their mode of action and catalytic activity, students will appreciate the pivotal role of these biomolecules in driving metabolic reactions. ➤ The importance of nitrogen metabolism, particularly biological nitrogen fixation in protein assimilation, will underscore the significance of these processes. ➤ Students will also acquire knowledge about various hormones and their roles in plant growth and development, as well as scientific aspects related to flowering, photomorphological mechanisms, and plant responses to environmental factors. Practicals- ➤ Students will engage in a range of experiments exploring key physiological processes in plants, including measuring osmotic potential, transpiration rates, photosynthesis, and respiration, enriching their understanding of plant biology. ➤ Calculating stomatal index and frequency in both mesophyte and xerophyte species will offer an intriguing aspect of plant anatomy for students. ➤ Through practical study, students will gain a comprehensive understanding of plant physiology and metabolism, enhancing their overall grasp of plant biology.

SEMESTER- V		
Course Code	Course Name	Course Outcomes
Discipline Specific Elective Course DSE1	PAPER1 Economic Botany and Plant Biotechnology	Theory- ➤ Students will gain knowledge about economically significant plants such as wheat, cereals, and legumes, including their morphology, uses, and vital role in meeting human dietary needs. ➤ They will learn about the importance and health benefits of spices and beverages deepening their understanding of plants' economic importance for human welfare. ➤ Understanding fiber-yielding plants like cotton is crucial due to the growing demand for food and clothing, providing students with valuable knowledge in this area. ➤ Exploring technology's impact on biological systems, including topics like plant tissue culture and its applications, will spark curiosity among students about potential career paths in tissue culture. ➤ Delving into advanced technologies such as recombinant DNA technology, DNA fingerprinting, and molecular DNA markers, along with their applications, will inspire students to consider forensic science as a future study option. ➤ Learning about disease diagnosis at the molecular level and gene therapy will highlight their significance in simplifying human life. Practicals ➤ Students will learn about various plants such as wheat, gram, soybean, black pepper, clove, tea, cotton, and groundnut through examination of specimens, sections, and microchemical tests. ➤ They will become acquainted with basic equipment and techniques, including micropropagation in tissue culture, providing them with foundational skills in plant biology. ➤ Students will also be introduced to standard molecular techniques such as PCR, blotting techniques, AGE, and PAGE, which will prove beneficial for those interested in pursuing research or careers in related fields.

SEMESTER- VI

Course Code	Course Name	Course Outcomes
DSE-1	PAPER 2 Industrial and Environmental Microbiology	Theory- ➤ Students will acquire extensive knowledge of microbial applications in the industrial sector, gaining theoretical insights into various industrial processes such as bioreactor design, medium formulation, and sterilization techniques, as well as different types of fermentation processes. ➤ They will also gain understanding of microbial production processes for industrial products including amylase, lipase, organic acids (e.g., citric or glutamic acid), ethanol, and antibiotics like penicillin, crucial for human welfare. ➤ Through the course, students will develop a comprehensive understanding of the occurrence, abundance, and distribution of microorganisms in the environment, as well as their environmental roles. ➤ They will understand the basic principles of environmental microbiology and application of the same in solving environmental problems like wastewater treatment and bioremediation of the contaminated soils. ➤ The course will spark interest and curiosity among students, potentially inspiring them to pursue careers in industrial microbiology. Practicals- ➤ Students will discover the intersection of science and society, understanding how to apply their knowledge to contribute to overall societal development, potentially fostering entrepreneurship in the microbiology field. ➤ They will acquire proficiency in isolating, maintaining, and handling crucial microbial cultures, alongside gaining fundamental practical skills in laboratory instrument operation.

SEMESTER- III/V		
Course Code	Course Name	Course Outcomes
Skill Enhancement Course (SEC 1/2)	PAPER 1 Biofertilizers	➤ Through the skill enhancement course on "Biofertilizer," students will grasp the significance of microbes in agriculture as growth enhancers, promoting crop development akin to chemical fertilizers but without any harmful chemicals. ➤ Through thorough study of isolating and multiplying microbes like <i>Rhizobium</i>, <i>Azotobacter</i>, and VAM for use as biofertilizers, students can learn to produce biofertilizers on a large scale for widespread agricultural application. ➤ Exploring organic farming practices such as green manuring, organic fertilizers, and recycling of biodegradable municipal, agricultural, and industrial wastes, including methods like biocompost and vermicomposting, will inspire students, especially those from rural areas, to implement these techniques in agriculture.

SEMESTER- IV/VI		
Course Code	Course Name	Course Outcomes
SEC1/2	PAPER2 Mushroom Culture Technology	➤ Mushrooms, valued for their social, economic, nutritional, and medicinal benefits, have captured global attention due to their immense potential. ➤ Exploring various edible mushroom types, cultivation techniques, factors influencing cultivation, storage methods, composting technology, and food preparation will deepen students' understanding of the market potential of mushrooms in India and abroad. ➤ Studying this field within the SEC curriculum will undoubtedly inspire students to consider mushroom cultivation as a viable livelihood option, potentially leading to a prosperous future.