Program Outcomes, Program Specific Outcomes and Course Outcomes of B.Sc. (General) in Botany Programme

Programme Outcomes: B.Sc. (General) in Botany Programme:

PO 1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.
PO 2: Problem solving (Ap): Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, apply one's learning to real life situations.
PO 3: Critical thinking (An): Capability to apply analytic thought to a body of knowledge; analyses and evaluate evidence, arguments, claims.
PO 4: Research-related skills / Scientific reasoning: A sense of inquiry and capability for asking relevant/appropriate questions, problematizing, synthesizing and articulating; Ability to recognize cause-and-effect relationships.
PO 5: Communication Skills (U/A): Ability to express thoughts and ideas effectively in writing and orally.
PO 6: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group.
PO 7: Information/digital literacy: Capability to use ICT in a variety of learning situations.
PO 8: Self-directed learning: Ability to work independently, identify appropriate resources required for a project.
PO 9: Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 10: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives.
PO 11: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team.
PO 12: Lifelong learning: Ability to acquire knowledge and skills, including "learning how to learn", that are necessary for participating in learning activities throughout life.

Programme Specific Outcomes: B.Sc. in Botany

In the modern era, the field of botany has expanded far beyond its classical roots, requiring botanists to possess a comprehensive understanding of various aspects of plant science. A contemporary botany program aims to equip students with the knowledge and skills needed to compete on a global scale, preparing them for further studies in modern biology and related or multidisciplinary fields.

Model Reference: University of Calcutta, Syllabus for Botany General under CBCS system

PSO1: Gain a comprehensive knowledge and understanding of plant diversity, including algae, fungi, bryophytes, pteridophytes and other aspects of plant science.

PSO2: Apply botanical knowledge and techniques to solve real-world problems related to plant science, agriculture, environmental conservation, and biotechnology.

PSO 3: Cultivate the ability to critically analyze and evaluate scientific data, research findings, and contemporary issues in Botany through a rigorous scientific approach.

PSO 4: Develop research-related skills, including formulating hypotheses, designing experiments, conducting investigations, and interpreting results, with an emphasis on understanding cause-and-effect relationships in plant sciences.

PSO 5: Enhance proficiency in communicating botanical concepts, research findings, and scientific arguments effectively through written reports, presentations, and discussions.

PSO 6: Foster the ability to work collaboratively in diverse teams, contributing to joint research projects, fieldwork, and laboratory tasks, while respecting different perspectives and contributions.

PSO 7: Utilize digital tools and information technology effectively for research, data analysis, and presentation in botanical studies, staying updated with advancements in the field.

PSO 8: Cultivate self-directed learning skills, encouraging independent exploration of botanical topics, and the continuous acquisition of knowledge and skills throughout one's career.

PSO 9: Gain an appreciation for the diversity of plant life across different cultures and geographical regions, understanding the global context of botanical research and its applications.

PSO 10: Embrace ethical principles in conducting botanical research, considering the environmental, societal, and ethical implications of scientific work.

PSO 11: Develop leadership qualities to guide and manage botanical projects, fostering innovation, teamwork, and effective decision-making in various professional settings.

PSO 12: Prepare for ongoing learning and adaptation in the ever-evolving field of Botany, emphasizing the importance of staying current with new scientific discoveries and technological advancements.

Course Outcomes: B.Sc. (General) in Botany

The core courses (CC) provide students with a comprehensive understanding of the subject. Through discipline-specific electives (DSE), students will explore the practical applications of the subject in both academic and industrial settings. Additionally, skill enhancement courses (SEC) will help students develop practical skills, preparing them for further academic studies, entrepreneurship, and careers in industry.

SEMESTER–I

CC1- PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY) (BOT-G-CC-1-1-TH & BOT-G-CC-1-1-P)

After Successful completion of this course, students will be able to:

CO-1	Understand the diversity of plant kingdom and their interactions and its importance in our daily life.
CO-2	Describe the life histories of representative algae, fungi and bryophytes.
CO-3	Evaluate the roles of algae, fungi, lichen, bryophytes in environmental sustainability, agriculture, biotechnology, and industrial applications. Understand and explain fungal symbioses, particularly Mycorrhiza and Lichen, and their ecological significance.
CO-4	Understand and explain the tissue organization and anatomy of roots, stems, and leaves in monocots and dicots and and describe different types of stomata.
CO-5	Analyze the process of secondary growth in dicot stems and identify anomalies.

SEMESTER–2

CC2- PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY, MORPHOLOGY AND TAXONOMY) (BOT-G-CC-2-2-TH & BOT-G-CC-2-2-P)

After Successful completion of this course, students will be able to:

CO-1	Identify and distinguish the diagnostic characters of Psilophyta, Lycophyta, Sphenophyta, Filicophyta, progymnosperms, Cycadophyta, Coniferophyta, and Gnetophyta, along with examples.
CO-2	Understand and observe vegetative and reproductive parts of various life forms of Pteridophytes and Gymnosperms.
CO-3	Learn about various fossils, fossilization process, geological time scale and Palynology also define palynology, recognize spores and pollen, and discuss

	their applications in various fields such as paleoclimate reconstruction, biostratigraphy, and forensic science.
CO-4	Learn about principles of plant traditional and numerical taxonomy, Identification, Classification, Nomenclature, herbariums, botanical gardens, taxonomic documentation, evidences; ranks and categories; selected classifications; Principles and Rules of ICN.
CO-5	Evaluate the economic importance of pteridophytes and gymnosperms in various aspects such as medicine, horticulture, and ecosystem roles.

SEMESTER–3

CC3- **CELL BIOLOGY, GENETICS AND MICROBIOLOGY (BOT-G-CC-3-3-TH & BOT-G-CC-3-3-P)**

After Successful completion of this course, students will be able to:

CO-1	Learn and explain Prokaryotic and eukaryotic cell, structure and functions of cell organelles, DNA packaging, ultrastructure and function of nucleolus and molecular organization of metaphase chromosomes, including the nucleosome concept, and its significance in genome stability and gene regulation.
CO-2	Understand the genetic mechanisms underlying aneuploidy and polyploidy and their implications in evolution and genetic disorders.
CO-3	Explain how genetic information encoded in DNA is transcribed into RNA and translated into proteins, and the regulatory mechanisms involved in these processes.
CO-4	Understand how the genetic code governs the translation of nucleotide sequences into amino acids and the implications of codon redundancy and universality.
CO-5	Interpret and analyze genetic data to determine the relative positions of genes on chromosomes and understand the concept of linkage groups.
CO-6	Understand the role of mutagens, both physical and chemical, in inducing genetic mutations and the mechanisms underlying mutagenesis.
CO-7	Get a Brief concept on the structure of bacteria and virus, their reproduction and economic importance.

SEMESTER–4

CC4- PLANT PHYSIOLOGY AND METABOLISM (BOT-G-CC-4-4-TH & BOT-G-CC-4-4-P)

After Successful completion of this course, students will be able to:

CO-1	Understanding Protein Structure and Enzyme Function and describe the structure of nucleic acids, including DNA and RNA types, and understand their roles in genetic information storage and expression. Classify enzymes according to the International Union of Biochemistry and Molecular Biology (IUBMB) guidelines and explain their mechanisms of action, including substrate binding and catalysis.
CO-2	Analysis of Plant Transport Mechanisms and Transpiration Process.
CO-3	Describe the role of pigments in photosynthesis, including their action spectra and the enhancement effect and understand the electron transport system and photophosphorylation, and compare and contrast the mechanisms of C3, C4, and CAM photosynthesis.
CO-4	Explain the biochemical reactions of glycolysis and the Krebs cycle, and their significance in cellular energy production and understand the electron transport system and oxidative phosphorylation and their roles in ATP synthesis during cellular respiration.
CO-5	Explain biological dinitrogen fixation and the synthesis of amino acids through reductive amination and transamination.
CO-6	Understanding the physiological roles of plant growth regulators such as auxin, gibberellin, cytokinin, ethylene, and abscisic acid (ABA) in plant growth and development.
CO-7	Understand the role of photoperiodism in regulating flowering in different plant types and the involvement of phytochrome and gibberellin in this process.
CO-8	Understand plant senescence, its triggers, and physiological processes involved.

SEMESTER–5

DSE A: (Group A) PHYTOCHEMISTRY AND MEDICINAL BOTANY (BOT-G-DSE-A-5-1-TH & BOT-G-DSE-A-5-1-P)

After Successful completion of this course, students will be able to:

CO-1	Develop concept on phytochemistry and medicinal botany and understand the concept of polyherbal formulations and their importance in traditional medicine systems.
CO-2	Understand Pharmacognosy, differentiate between primary metabolites and secondary metabolites and describe the functions of secondary metabolites

	such as alkaloids, terpenoids, and phenolics and have concept on organoleptic evaluation of drugs and pharmacologically active constituents.
CO-3	learn about the plant sources, parts used, and therapeutic uses of specific compounds such as diosgenin, digitoxin, catechin, gingerol, curcuminoids, strychnine, reserpine, vinblastine, and capsaicin.
CO-4	Understanding of ethnobotany and its applications in traditional medicine systems and analyze the role of natural products derived from medicinal plants in the treatment of specific diseases such as jaundice, cardiac ailments, and diabetes, based on ethnobotanical knowledge and folk medicine practices.
CO-5	Prepare buffer and solution and develop concepts on different laboratory instrument.
CO-6	Understand the principles behind different chemical tests such as Biuret test, Ninhydrin test, and Molisch's test for proteins, carbohydrates tannin and alkaloids and identify different medicinal plants.

SEC A: PLANT BREEDING AND BIOMETRY (BOT-G-SEC-A-3/5-1)

After Successful completion of this course, students will be able to:

CO-1	Understand the Principles and Objectives of Plant Breeding.
CO-2	Gain knowledge in various techniques of hybridization, including emasculation, pollination, and hybrid seed production and understand the principles behind controlled crosses and the selection of parental lines for hybridization.
CO-3	Evaluate the advantages and limitations of mass and pure line selection methods in crop improvement programs.
CO-4	Understand the concept of heterosis (hybrid vigor) and its significance in hybrid seed production.
CO-5	Understand the principles and applications of biotechnology tools such as genetic engineering and molecular markers in crop breeding programs.
CO-6	understand measures of central tendency such as mean, median, and mode, and statistical tools such as standard error, standard deviation, and chi-square test for goodness of fit.

SEMESTER–6

DSE B: HORTICULTURAL PRACTICES AND POST HARVEST TECHNOLOGY (BOT-G-DSE-B-6-4-TH & BOT-G-DSE-B-6-4-P)

SEC A: PLANT BREEDING AND BIOMETRY (BOT-G-SEC-A-3/5-1)

After Successful completion of this course, students will be able to:

CO-1	Understand different horticultural practices and post harvest technology
CO-2	Develop basic concept of ornamental plants and learn production, origin and distribution; management and marketing of vegetable and fruit crops.
CO-3	Develop Basic concept of Field and post-harvest diseases; Identification of deficiency symptoms; remedial measures.
CO-4	Have a knowledge on the nursery, vegetable garden, crop site and cold storage.

SEC B: MUSHROOM CULTURE TECHNOLOGY (BOT-G-SEC-D-4/6-4)

After Successful completion of this course, students will be able to:

CO-1	Understand the knowledge of edible and poisonous mushroom in case of physical situation in field.
CO-2	Identify and cultivate various species of mushrooms.
CO-3	Categorize between the species which can be cultivated during winter and spring season.
CO-4	Construct mushroom bed depending on the species and weather conditions.

	CC-1														
CO	**PO**												**PSO**		
	PO1 Disciplinary knowledge	**PO2 Problem solving**	**PO 3 Critical thinking**	**PO4 Research related skills/Scientific reasoning**	**PO5 Communication skills**	**PO6 Cooperation /team work**	**PO7 Information or digital literacy**	**PO8 Self-directed learning**	**PO9 Multicultural competence**	**PO10 Moral and ethical awareness**	**PO11 Leadership quality**	**PO12 Lifelong learning**	**PSO1**	**PSO2**	**PSO3**
CO 1	**3**	**0**	**2**	**1**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**4**	**4**	**0**	**0**
CO 2	**2**	**1**	**1**	**0**	**2**	**0**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**0**
CO 3	**2**	**1**	**1**	**0**	**2**	**0**	**2**	**2**	**2**	**2**	**2**	**2**	**0**	**0**	**1**
CO 4	**2**	**0**	**0**	**1**	**0**	**0**	**2**	**1**	**2**	**1**	**1**	**0**	**1**	**1**	**2**
CO 5	**0**	**0**	**1**	**0**	**2**	**3**	**2**	**0**	**2**	**1**	**2**	**3**	**1**	**1**	**0**
CO 6	**2**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**1**
CO 7	**0**	**0**	**0**	**1**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
CO	**2.2**	**1.00**	**1.25**	**1.00**	**2.00**	**1.00**	**2.16**	**1.75**	**2.2**	**1.6**	**1.8**	**3.00**	**2.2**	**1.25**	**1.25**