

# Course Outcome of Botany Honours under 1+1+1 System

## **Paper I (Theory) & III (Practical): Algae, Fungi & Lichen, Microbiology, Plant Pathology**

Upon successful completion of this paper, students will gain a comprehensive understanding of the diverse world of algae and microorganisms, their interactions with plants, and their significance in the environment and human health.

Students will be able to identify and classify common algae and microorganisms using microscopic and biochemical techniques.

Students will develop skills in aseptic techniques and culture methods for studying microorganisms.

Upon completion of this paper, students will gain in-depth knowledge about the vast world of fungi that constitutes a distinct kingdom of their own.

Students will also learn about different types of plant diseases, disease cycles and factors affecting disease development, mechanisms of disease resistance as well as the principles of plant disease management.

## **Paper II (Theory): Bryophyta, Pteridophyta, Gymnosperms, Palaeobotany**

Students will gain a comprehensive understanding of the Bryophytes, Pteridophytes and Gymnosperms, their morphological, anatomical, and physiological features.

They will be able to analyze the evolutionary relationships between different archegoniate groups and their significance in plant evolution as well as appreciate the ecological roles and economic importance of archegoniates in diverse ecosystems.

## **Paper IV (Theory): Morphology, Palynology, Taxonomy of Angiosperms, Ecology and Plant geography**

Upon successful completion of this course, students will possess a comprehensive understanding of plant morphology and anatomy, encompassing both vegetative and reproductive structures across various plant groups.

Upon successful completion of this course, students will grasp plant interactions with environment & communities, analyze factors shaping plant distribution globally & regionally, and master biogeographical patterns & vegetation types worldwide.

They will be able to evaluate human impacts & conservation strategies for ecosystems, and develop field research & data analysis skills in plant ecology.

Completing the Plant Systematics course in B.Sc. Botany Honours equips students with an adept understanding of plant taxonomy. They will master classification principles, herbarium techniques, and molecular tools for evolutionary analyses. Students refine field botany skills, contribute to biodiversity studies, and critically evaluate taxonomic literature. This prepares them to apply taxonomic knowledge to real-world challenges, ensuring a solid foundation for careers in botanical research, conservation, and ecological management.

#### **Paper V (Theory): Anatomy and Embryology and Biochemistry**

Upon successful completion of this course, students will possess a comprehensive understanding of plant morphology and anatomy, encompassing both vegetative and reproductive structures across various plant groups.

The Biochemistry theory paper equips Botany Honours undergraduate students with a comprehensive understanding of biochemical processes in plants, including metabolism, enzymology, and molecular biology. Students gain foundational knowledge essential for exploring plant physiology, genetics, and biotechnology, preparing them for advanced studies and research in botanical biochemistry.

#### **Paper VI (Practical): Angiosperm Anatomy, Bryophyte, Pteridophyte, Gymnosperm, Palaeobotany**

Upon completing a course on the anatomy of angiosperms, bryophytes, pteridophytes, gymnosperms, and paleobotany, graduates will possess a comprehensive understanding of plant structure and evolution. They will be able to identify and describe the detailed anatomical features of various plant groups, including roots, stems, leaves, flowers, and reproductive structures, and conduct laboratory studies using microscopy and other techniques. Graduates will also be able to analyze the evolutionary relationships and adaptations of different plant groups, and interpret the significance of fossil evidence to reconstruct the evolutionary history of plants. Furthermore, they will be able to apply their knowledge of plant anatomy and evolution to fields such as ecology, systematics, and biotechnology, and effectively communicate scientific information through written reports, oral presentations, and visual displays.

#### **Paper VII (Theory): Plant Physiology, Pharmacognosy and Plant Biotechnology**

Students will gain a comprehensive understanding of the fundamental physiological processes in plants, including photosynthesis, respiration, water relations, mineral nutrition, transport, growth and development, reproduction, and stress responses.

They will learn to appreciate the interrelationships between plant physiology and other botanical disciplines such as plant anatomy, morphology, ecology, and evolution.

They will recognize the significance of plant physiology in agriculture, horticulture, forestry, and environmental science and understand the applications of plant physiology in crop improvement, plant breeding, and sustainable agriculture practices.

Upon completing a course in Pharmacognosy, students will be able to identify and classify medicinal plants and their products, and explain the pharmacological and therapeutic properties of plant-derived drugs. They will also be able to analyze the quality and efficacy of herbal remedies, and apply their knowledge in drug discovery, development, and research. By achieving these learning outcomes, students will gain a comprehensive understanding of pharmacognosy and be prepared for careers in the field of natural product drug discovery and development.

In the Plant Biotechnology course of B.Sc. Botany Honours, students gain expertise in applying biotechnological tools to manipulate plant traits. They learn genetic engineering techniques, explore molecular markers, and understand genomic applications in plant science. This equips them to address contemporary challenges in agriculture, environmental sustainability, and biodiversity. The course fosters critical analysis, laboratory skills, and ethical considerations, preparing students for careers in cutting-edge plant biotechnology research and its applications in botanical sciences.

### **Paper VIII (Theory): Cell Biology, Genetics and Molecular Biology, Plant Breeding and Biometry**

Upon completing the Cell Biology course, students will grasp the intricacies of biomolecular structures and functions. They'll demonstrate proficiency in cell biology principles, applying them to plant systems.

Students will develop critical thinking skills for data analysis, excel in laboratory techniques, and communicate scientific concepts effectively. The course prepares them to comprehend the molecular basis of botanical phenomena, fostering a foundation for advanced studies or careers in botanical research.

In the Genetics course of B.Sc. Botany Honours, students acquire a comprehensive understanding of plant genetics, encompassing Mendelian inheritance, molecular genetics, and genetic diversity. They develop proficiency in genetic analysis, applying techniques to address botanical challenges. Students explore the genetic basis of plant traits, contributing to advancements in agriculture and conservation. This course cultivates critical thinking and communication skills, preparing students for careers in genetic research and applied fields within the botanical sciences.

Upon successful completion of this course, students will be able to explain the fundamental principles of molecular biology, including the structure and function of DNA, RNA, and proteins.

They will have a thorough understanding of the central dogma of life and the process of DNA replication, transcription, and translation.

Upon completing a program in Plant Breeding and Biometry, graduates will be able to apply principles of genetics, statistics, and biometry to develop improved crop varieties, design and analyze experiments to evaluate plant traits, and utilize quantitative methods to understand plant breeding processes. They will also be able to critically evaluate and select appropriate breeding methods, utilize molecular tools to enhance breeding programs, and communicate effectively with stakeholders to address crop improvement needs. Furthermore, graduates will demonstrate expertise in data analysis, interpretation, and presentation, and be prepared to contribute to the development of sustainable crop production systems and innovative agricultural practices.

#### **Paper IX (Practical): Plant Physiology, Plant Biochemistry and Pharmacognosy**

The practical paper on Plant Physiology, Plant Biochemistry, and Pharmacognosy provides Botany Hons undergraduate students with hands-on experience in analyzing plant functions, biochemical pathways, and medicinal properties of plants. Students develop skills in experimental techniques, metabolic analysis, and identifying pharmacologically active compounds, preparing them for advanced research and careers in plant sciences, biotechnology, and herbal medicine.

#### **Paper X (Practical): Study of chromosomes and mitotic index and Biometry**

The practical paper on the study of chromosomes, mitotic index, and biometry equips Botany Hons undergraduate students with skills in cytogenetic techniques and statistical analysis. Students learn to prepare and analyze chromosome samples, calculate mitotic indices, and apply biometry for data interpretation, enhancing their research capabilities and preparing them for advanced studies in genetics and plant biology.

# Program Outcome

## B.Sc. (Honours) in Botany

### 1+1+1 System

Upon successful completion of a Bachelor of Science with Honours in Botany program, graduates will acquire the following skills:

#### **Knowledge and Understanding:**

Plant Biology: Possess a comprehensive understanding of plant morphology, anatomy, physiology, metabolism, development, reproduction, and evolution.

Diversity and Classification: Identify and classify plants from different taxonomic groups.

Ecology and Plant Communities: Understand the interaction between plants and their environment, analyze plant communities, and assess the impact of environmental change on plant life.

Biotechnology and Applied Botany: Apply their knowledge of plant science to areas such as agriculture, horticulture, forestry, environmental conservation, and medicine.

Scientific Methods: Design and conduct scientific experiments, collect and analyze data, and interpret results effectively.

#### **Cognitive Skills:**

Critical Thinking and Problem-Solving: Analyze complex biological problems, propose solutions, and evaluate their feasibility.

Scientific Reasoning and Decision-Making: Apply scientific principles to draw conclusions and make informed decisions based on evidence.

Research Skills: Formulate research questions, access and evaluate scientific literature, conduct independent research, and communicate findings effectively.

## **Practical Skills:**

Laboratory Techniques: Perform a variety of laboratory techniques in plant biology, including plant identification, microscopy, biochemical assays, plant extraction, molecular biology, and tissue culture.

Fieldwork and Data Collection: Conduct field studies, collect plant specimens, and record data accurately.

Data Analysis and Interpretation: Use statistical software and other tools to analyze and interpret biological data.

Communication Skills: Write scientific reports, prepare presentations, and effectively communicate complex scientific concepts to diverse audiences.

## **Personal and Interpersonal Skills:**

Time Management and Self-Discipline: Effectively manage their time, set goals, and independently pursue their academic and professional development.

Teamwork and Collaboration: Work effectively as part of a team in research and learning environments.

Ethical Awareness and Professional Conduct: Understand and adhere to ethical principles in scientific research and professional practice.

Lifelong Learning: Maintain a commitment to lifelong learning and adapt to the rapidly changing field of Botany.

Additionally, graduates of a BSc. Honours in Botany program may be able to:

- Pursue postgraduate studies in plant science, including M.Sc or M.Tech degrees, PhD programs, or professional masters programs.
- Seek employment as scientist, academicians, and educators in different institutions such as Research Institutes, Universities, Colleges, Schools, Government Organizations, Forensic Laboratories, MNCs, and NGOs.
- Seek future career as an officer at Indian Forest Service, State Forest Service, Food Corporation of India, Directorate of Plant Protection, Quarantine, & Storage, Botanical Survey of India, Ministry of Petroleum and Natural Gas,

Kolkata Municipal Corporation, Biodiversity Board, Tea Board, Pollution Control Board and so on.

- Develop entrepreneurial skills and create their own businesses in areas related to plant science.
- Become informed advocates for environmental conservation and sustainable practices.

## **B.Sc. (General) in Botany**

A Botany Generic Elective/Minor course can be a valuable addition to any student's academic program. It can provide students with a strong foundation in plant biology, develop important skills, and foster a love for the natural world.

**Increased knowledge and understanding of the plant world:** Students will gain a strong foundation in plant biology, including plant anatomy, physiology, ecology, and evolution. They will be able to identify and classify different types of plants, understand how plants function, and appreciate the role of plants in the environment.

**Development of critical thinking and problem-solving skills:** Students will learn to analyze scientific data, draw conclusions, and solve problems related to plants. They will be able to evaluate different viewpoints and make informed decisions about plant-related issues.

**Improved communication skills:** Students will learn to communicate effectively about plants, both orally and in writing. They will be able to present their findings in a clear and concise manner to both scientific and non-scientific audiences.

**Enhanced appreciation for the natural world:** Students will develop a greater appreciation for the beauty and complexity of the plant world. They will understand the importance of plants in the environment and be able to make informed decisions about their own impact on the planet.

**Preparation for further study or careers in Botany:** Students who take a Botany generic elective course will be well-prepared to pursue further study in botany or a related field. They will also be prepared for careers in plant research, education, conservation, or agriculture.