

## **B.Sc. (Hons.) Botany**

### **Program Outcomes**

#### **GRADUATE ATTRIBUTES IN SUBJECT**

The B.Sc. - Botany programme is formed to gain knowledge and technical skills to study plants in a holistic manner. Students would get training in various disciplines of plant sciences using a combination of core and elective papers with significant inter-disciplinary components.

#### **Disciplinary knowledge**

The B.Sc. - Botany programme enables the students in gaining knowledge and technical skills to study plants in a holistic manner. Students would get training in various disciplines of plant sciences using a combination of core and elective papers with significant inter-disciplinary components. Students would be exposed to basic and advanced knowledge that are currently used in the study of plant life forms, adaptation, evolution, classification, ultrastructure and various processes in the plant system and interaction of plants with other organisms and with the ecosystem. Knowledge of use of plants in biotechnology, their economic value and their social and environmental significance would be gained by the students.

#### **Scientific reasoning**

In addition to academic acquaintance and training in the various fields of plant sciences. Students would also get training in application of the subject, critical thinking, reasoning and analytical skills, effective communication, laboratory safety, and sensitivity to environment and sustainable living.

#### **Critical thinking**

The course enhances the skill of thinking about the application of the biology

#### **Disciplinary knowledge**

The programme also has a strong interdisciplinary component. Emphasis is given on the experimental learning through hands-on laboratory exercises, field trips and assignments. Current thrust areas of teaching provide students with substantial exposure and skills in plant biology.

#### **Critical thinking**

Learning of the basic concepts, principles and processes in plant biology and have the ability of explanation of principles and usage of the acquired knowledge in applied botany. An increased understanding of fundamental concepts and their applications of scientific principles is expected in the student. Students will become critical thinker and acquire problem solving capabilities. They are expected to know basics of cognitive biases, mental models, logical fallacies, scientific methodology and constructing cogent scientific arguments.

#### **Analytical reasoning**

The student would develop a skill to analyse the knowledge of the subject and think in a multidirectional way to solve the problem and to gain benefit in a sustainable manner. They would be able to think about the use of plants as industrial resources or as human livelihood support

system and is well versed with the use of transgenic technologies for basic and applied research in plants. The students will be able to demonstrate the knowledge in understanding research and addressing practical problems. Student will learn the application of various scientific methods to address different questions by formulating the hypothesis, data collection and critically analyse the data to decipher the degree to which their scientific work supports their hypothesis.

### **Reflective thinking**

The structure and content of the course enables students to reflect on the learnings from different courses and integrate the same for a problem-solving approach. They would be capable of correlating various concepts applicable to diverse situations and phenomenon.

### **Multicultural competence**

Understanding of various analytical techniques of plant sciences, use of plants as industrial resources or as human livelihood support system and is well versed with the use of transgenic technologies for basic and applied research in plants.

### **Lifelong learning**

The subject of botany the applied theoretically and practically applied in day today life. The successful students will be able to learn the basic concepts, principles and processes in plant biology. They have the ability of explanation of concepts, principles and usage of the acquired knowledge in biotechnological, pharmaceutical, medical, ecological and agricultural applications. Use basic biology techniques to explore molecular biology of plants

### **Self-directed learning**

The programme also has a strong interdisciplinary component. Emphasis is on experiential learning through hands-on laboratory exercises, field trips and assignments. Current thrust areas of teaching provide students with substantial exposure and skills in plant biology.

### **Communication Skills**

The students will develop a confidence on gaining the knowledge and skill after this course and they will be able to effectively communicate their views, present their work and impress the audience. Students are expected to possess a standard of communication skills expected from a science graduate in the country. They are expected to read and understand documents with in-depth analyses and logical arguments. Graduates are expected to be well-versed in speaking and communicating their idea/finding/concepts to a wider audience

### **Research-related skills**

This course provides wide interdisciplinary knowledge and stimulates the students to think beyond the course knowledge, apply this knowledge for solving the environmental problems, efficient use of resources by designing novel and innovative experiments. Students are expected to be aware about activities in the natural surroundings to awaken their curiosity. They are expected to design a scientific experiment through statistical hypothesis testing and reasoning.

### **Cooperation/Team work**

The students would learn team work, division of the work and the corporate life of the academics. They are expected to be team players, with productive cooperation involving members from diverse socio-cultural backgrounds.

### **Information/digital literacy**

The students would learn the use of the new technologies used in learning biology, digital platforms for fast transfer of information. Students will acquire digital skills and integrate the fundamental concepts with modern tools.

### **Moral and ethical awareness/reasoning**

Besides the theoretical knowledge, the student is acquainted with moral and ethical duties, an awareness towards the conservation of nature and natural resources. Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses. Learners are expected to be responsible citizen and be aware of moral and ethical duties. They are expected to define their core ethical virtues good enough to distinguish what construes as illegal and criminal under Indian constitution. Learners should know academic and research ethics, Benefit Sharing, Plagiarism, Scientific Misconduct etc.

### **Leadership readiness/qualities**

The vast and deep knowledge of the subject, analytical and scientific reasoning, effective communication and problem-solving task develop special qualities in a person to attract and influence the audience, which would be gained after the completion of this course. Students are expected to be familiar with decision making process and basic managerial skills to become a better leader. Skills may include defining objective vision and mission, how to become responsible citizens and charismatic inspiring leader.

## **PROGRAMME SPECIFIC OUTCOME**

### **Aim of Bachelor Degree Program in B. Sc. Hons**

The programme is designed to equip students with essential knowledge and technical skills to study plants and related subjects in a holistic manner. Students would be exposed to cutting-edge technologies that are currently used in the study of plant life forms, their evolution and interactions with other organisms within the ecosystem. The following are detailed programme specific outcomes:

- Provide an introduction to Biodiversity ranging from Microbes (Viruses and Bacteria), to Fungi, including diverse plant groups (Algae and Archegoniates-Bryophytes, Pteridophytes and Gymnosperms).
- To enable students to understand and appreciate the relevance of Microbes and Plants to environment (ecological significance) and human well-being (economic importance).
- Develop an understanding of Evolution of Plant forms and the consequent Biodiversity. These are instrumental in creating awareness on the threats to biodiversity and sensitize students towards the Conservation of Biodiversity for sustainable development.
- To study the organization of cell, cell organelles and biomolecules (i.e. protein, carbohydrate, lipid and nucleic acid) to gain knowledge on the activities in which the diverse macro molecules and microscopic structures inhabiting the cellular world of life are engaged. This will enable the students to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.
- To introduce students to application of microbes in Industrial production and Environmental remediation strategies.

- New knowledge and widening of the knowledge acquired in by handling of classical and modern plant biotechnology processes, including tissue culture for healthy plants, plants with improved characteristics.
- To explore the natural genetic variation in plants and to understand how diverse factors (at the cellular level) contribute to the expression of genotypes and hence to phenotypic variation.
- Understanding of biotechnological processes such as recombinant DNA technology and its applicative value in pharmaceuticals (vaccines, antibodies, antibiotics etc.), food industry (transgenic crops with improved qualities (nutraceuticals, industrial enzymes etc.), agriculture (biotic and abiotic stress tolerant plants, disease and pest resistant plants, improved horticultural varieties etc.), ecology (plants role in bioremediation). This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture.
- In the laboratory classes, students will perform some of the techniques currently used to generate information and detect genetic variation. 10. Understanding of plant classification systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various plants groups.
- Understanding of various analytical techniques of plant sciences, use of plants as industrial resources or as human livelihood support system and the use of transgenic technologies for basic and applied research in plants.
- Understanding of various life forms of plants, morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA technology, transgenic technology and use of bioinformatics tools and databases and in the application of statistics to biological data.
- To provide new information, enhance core competency and discovery/inquiry-based learning of learners. A botany graduate would be competent in the field to undertake further discipline specific studies, as well as to begin domain-related employment.

### **Programme Learning outcomes for B.Sc. (Hons.) Botany**

The following are the programme learning outcomes for B. Sc. (H) Botany.

- Understanding of plant classification systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various life-forms.
- Understanding of various analytical techniques of plant sciences, use of plants as industrial resources or as human livelihood support system and is well versed with the use of transgenic technologies for basic and applied research in plants.
- Understanding of various life forms of plants, morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA technology, transgenic technology and use of bioinformatics tools and databases and the application of statistics to biological data.