

## **B. Sc. BOTANY: PROGRAM OUTCOMES**

### **Specific core discipline knowledge**

Students can recall details and information about the evolution, anatomy, morphology, systematics, genetics, physiology, ecology, and conservation of plants and all other forms of life.

Students can recall details of the unique ecological and evolutionary features of the local and Indian flora.

### **Communication skills**

Students can communicate effectively using oral and written communication skills

### **Problem solving and research skills**

Students can generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context.

## **B. Sc. BOTANY: PROGRAM SPECIFIC OUTCOMES**

To recognize and identify major groups of cryptogams and phanerogams and their phylogenetic relationships.

To understand the phylogeny of plants and study various systems of classification.

To explore the morphological, anatomical, embryological details as well as economic importance of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.

To understand physiological processes and adaptations of plants.

To provide knowledge about environmental factors and natural resources and their importance in sustainable development.

To explain how current medicinal practices are often based on indigenous plant knowledge and to get introduced to different perspectives on treating ailments according to ethnomedicinal principles.

To understand patterns of heredity and variation among individuals, species and populations and apply principles for improvement of quality and yield.

To be able to apply statistical tools to gain insights into significantly different data from different sources.

To acquire recently published knowledge in molecular biology, such as rDNA technology; PTC and bioinformatics and their applications.

To be able to carry out phytochemical analysis of plant extracts and application of the isolated compounds for treatment of diseases.

To be able to deal with all microbes and the technologies for their effective uses in industry and mitigation of environmental concerns.

## **Course Outcomes**

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### **Semester I**

#### **Paper I: Plant Diversity I**

##### **USBO101 & USBOP1**

To understand the salient features of algae, life cycle patterns with a suitable example; to be able to identify them as well as economic importance of algae.

To learn the general characteristics and classification of fungi; life cycles patterns with a suitable example; to be able to identify them as well as their mode of nutrition and economic importance.

To learn the general characteristics and classification of bryophyta; life cycle pattern with a suitable example; to be able to identify them.

#### **Paper II: Form & function I**

##### **USBO102 & USBOP1**

To understand general structure of plant cell with respect to plant cell wall, plasma membrane, ultra-structure and functions of cell organelles like Endoplasmic reticulum and Chloroplast.

To understand energy pyramids, energy flow in an ecosystem, types of ecosystems such as aquatic and terrestrial.

To understand Mendelian and Non mendelian inheritance pattern and ratios.

### **Semester II**

#### **Paper I: Plant Diversity I**

##### **USBO201 & USBOP2**

To learn the general features and classification of pteridophyta; life cycle pattern with a suitable example, stelar evolution; to be able to identify them.

To learn the general features and classification of gymnosperms; life cycle pattern with a suitable example, economic importance; to be able to identify them.

To understand plant morphology with reference to leaf and inflorescence.

To provide plant description, distinguishing features of families so also identify and classify according to Bentham and Hooker's system.

### **Semester II**

#### **Paper II: Form & function II**

##### **USBO202 & USBOP2**

To understand plant tissue types with special reference to epidermal tissue system and internal primary structure of angiosperms.

To understand mechanism of photosynthesis.

To understand concept of primary and secondary metabolites and difference between them.

To understand few medicinally important plants.

**SY**

**Semester III**

**Paper I: Plant diversity II**

**USBO301 & USBOP3**

To provide general characters and economic importance of division Pheophyta; life cycle pattern with a suitable example; to be able to identify them.

To provide general characters of class Anthocerotae and Musci; life cycle patterns with a suitable example; to be able to identify them.

To understand taxonomy in relation to Anatomy, Palynology, Chemical constituents, Embryology, Cytology, Ecology.

To provide plant description, distinguishing features of families so also identify and classify according to Bentham and Hooker's system.

To understand modern techniques to study plant diversity like plant preservation, microscopy, chromatography and electrophoresis.

**Paper II: Form and function II**

**USBO302 & USBOP3**

To understand ultra-structure of cell organelles like mitochondria, Peroxisomes, Glyoxysomes and Ribosomes; cell cycle and nucleic acids.

To understand variation in chromosome structure, sex determination, sex linked, sex influenced and sex-limited traits, sex determination and extranuclear genetics.

To understand DNA replication and protein synthesis in prokaryotes and eukaryotes.

**Paper III: Current trends in plant sciences I**

**USBO303 & USBOP3**

To study Indian Herbal and Ayurvedic Pharmacopoeia with genuine medicinal plants and their possible adulterants.

To understand forest types of India, agro-forestry, urban forestry, organic farming, silviculture.

To provide economic importance of plants w. r. t. fibres, spices and condiments.

To understand concept of aromatherapy, botanical and nutraceuticals of few plants.

To learn about enzyme industry and biofuels.

**SY**  
**Semester IV**  
**Paper I: Plant diversity II**  
**USBO401 & USBOP4**

To understand general characters of Ascomycetae, life cycle pattern of suitable examples; to be able to identify them.

To understand crop diseases with suitable examples.

To learn classification, structure, method of reproduction, economic importance and ecological significance of lichens.

To understand Salient features and classification of Psilophyta and Lepidophyta; life cycle pattern of suitable examples; to be able to identify them.

To study Paleobotany w. r. t. the geological time scale; formation and types of fossils; structure and systematic position of form genus Rhynia.

**Paper II: Form and Function II**  
**USBO402 & USBOP4**

To study normal Secondary Growth in Dicotyledonous stem and root, mechanical tissue system and types of vascular bundles.

To study respiration, photorespiration, photoperiodism and vernalization.

To study biogeochemical cycles, ecological factors and community ecology.

**Paper III: Current trends in plant sciences II**  
**USBO403 & USBOP4**

To learn about basic principles of horticulture and gardening.

To study various types of gardens.

To get exposure to principles and techniques of plant tissue culture.

To use statistical techniques as chi square test and coefficient of correlation.

To understand basic principles behind bioinformatics and various tools used in it.

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**Semester V**  
**Paper I: Plant diversity III**  
**USBO501 & USBOP5**

The students would be able:

- To gain knowledge about microbial diversity and techniques for culturing and visualization.
- To understand the salient features of three major groups of algae, their life cycle patterns with a suitable example; to be able to identify them.
- To learn the general characteristics and classification of two major groups of fungi along with life cycles of each group; to be able to identify them.
- To understand the scope and importance of Plant Pathology and apply the concepts of various control measures of commonly widespread plant diseases.

**Paper II: Plant diversity IV**  
**USBO502 & USBOP5**

The students would be able:

- To acquire knowledge of different fossil forms and understand their role in evolution.
- To provide plant description, describe the morphological and reproductive structures of seven families and also identify and classify according to Bentham and Hooker's system.
- To gain proficiency in the use of keys and identification manuals for identifying any unknown plants to species level.
- To relate anomalies in internal stem structure with function and appreciate the salient features of the root stem transition zone.
- To get exposure to pollen study and learn to apply it in various fields.

**Paper III: Form and function III**  
**USBO503 & USBOP6**

The students would be able:

- To acquire knowledge about two important organelles and molecular mechanisms of translation
- To understand water relations of plants, inorganic and organic solute transport, and apply the knowledge to manage mineral nutrition and survival in challenging abiotic stresses.
- To understand succession in plant communities and study remediation technologies in order to apply knowledge acquired for cleanup of polluted sites.
- To get exposure to principles and techniques of plant tissue culture and apply these studies for improving agriculture and horticulture and to become an entrepreneur.

**Paper IV: Current trends in plant sciences II**  
**USBO504 & USBOP6**

The students would be able:

- To get exposure to the technique of mushroom cultivation and explore the possibility of entrepreneurship in the same.
- To learn ethnobotanical principles, applications and utilize indigenous plant knowledge for the cure of common human diseases and improvement of agriculture.
- To gain knowledge about the latest molecular biology techniques for isolation and characterization of genes.
- To learn principles and application of commonly used techniques in instrumentation.
- To gain proficiency in the monograph study and pharmacognostic analysis of six medicinal plants.

**Semester VI**  
**Paper I: Plant diversity III**  
**USBO601 & USBOP8**

The students would be able:

To identify, describe and study in detail the life cycles of three Bryophytes.

To and study in detail classification and general characters of three classes of Pteridophytes and identify as well as describe the life cycles of one example from each class.

To study evolutionary aspects and economic utilization of Bryophytes and Pteridophytes.

To identify, describe and study in detail the life cycles of three Gymnosperms.

**Paper II: Plant diversity IV**  
**USBO602 & USBOP8**

The students would be able:

To study contribution of Botanical gardens, BSI to Angiosperm study and provide plant description, describe the morphological and reproductive structures of seven families.

To gain exposure to a phylogenetic system of classification.

To gain insight into the anatomical adaptations of different ecological plant groups.

To understand development plant of male and female gametophytes, embryonic structure and development.

To understand the different aspects and importance of Biodiversity and utilize them for conservation of species so as to prevent further loss or extinction of Biodiversity and preserve the existing for future generations.

**Paper III: Form and function III**  
**USBO603 & USBOP9**

The students would be able:

To study various plant biomolecular structures and appreciate the structures, role, functions and applications of enzymes.

To gain insight into the Nitrogen and plant hormone metabolism with applications of the same in agriculture and horticulture.

To understand principles of genetic mapping , mutations and solve problems based on them, gain knowledge of various metabolic disorders and their implications.

To generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context, using suitable statistical techniques.

**Paper IV: Current trends in plant sciences II**  
**USBO604 & USBOP9**

The students would be able:

To gain insight into recent molecular biology techniques for DNA analysis and amplification and Barcoding techniques and applications therein.

To understand and apply tools of Bioinformatics for data retrieval and phylogenetic analysis.

To learn about the sources of economically important plants in the field offats and oils and apply it for extraction, dealing with entrepreneurship in the field.

To gain knowledge and proficiency in preservation of post-harvest produce and explore the possibility of entrepreneurship in the field.