

## **B.Sc. Botany Programme Outcomes**

**PO1. . Scientific Knowledge:** Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form.

**PO2. Knowledge and understanding of:**

1. The range of evaluation of plant diversity in terms of structure, function and environmental relationships.
2. A selection of more specialized, optional topics and the role of plants in the functioning of the global ecosystem. Statistics as applied to biological data.

**PO3. Practical skills:**

Students learn to carry out practical work, in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain methods

1. Interpreting plant morphology and anatomy.
2. Plant identification.
3. Vegetation analysis techniques.
4. A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry.
5. Analyze data using appropriate statistical methods and computer packages.

**PO4. Intellectual skills – able to:**

1. Assimilate knowledge and ideas based on wide reading through books and the internet.
2. Transfer of appropriate knowledge and methods from one topic to another within the subject. Understand the evolving state of knowledge in a rapidly developing field e.g. Tree Plantation, Beejmataka. Plan, conduct excursion study tour and write a report on project work.

**PO5. Transferable skills:**

1. Use of ICT & Communication of scientific ideas in writing and orally.
2. Ability to use library resources.
3. Time management and Career planning.

**PO6. Problem analysis:** Identify the taxonomic position of plants, research literature, and analyze plants with conclusions using first principles and methods of nomenclature and classification in Botany.

**PO7. Design/development of solutions:** Design solutions from medicinal plants for health problems, disorders and disease of plants and estimate the photochemical content of plants which meet the specified needs to appropriate consideration for the farmers to control diseases.

**PO8. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.

**PO9. Modern tool usage:** Apply appropriate techniques, resources, and instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.

**PO10. The Botanist and society:**Apply reasoning informed by the knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

**PO11. Environment and sustainability:** Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO12. Communication:** write effective reports and design documentation, make effective presentations and give and receive clear instructions. Such as Tree census data in campus or surrounding area.

**PO15. Project management and finance:** Demonstrate knowledge and understanding of the principles and apply these to manage projects and in multidisciplinary environments.

**PO16. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **Course Outcomes of B.Sc. Botany**

**CO1.** Critically evaluation of ideas and arguments by collection relevant information about the plants, so as to recognize the position of plant in the broad classification and phylogenetic level.

**CO2.** Identify problems and independently propose solutions using a depth and breadth of knowledge/expertise in the field of Plant Identification.

**CO3.** Accurately interpret the collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy.

**CO4.** Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.

**CO5.** Students will be able to present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists.

**CO6.** Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

**CO7.** Students will be able to apply fundamental tools (statistical) and the analysis of relevant biological situations.

**CO8.** Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.

**CO9.** They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.

**CO10.** Students will be able to explain how Plants function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants.

**CO11.** Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

**CO12.** Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

## **Programme Specific Outcomes: [PSOs of B.Sc. Botany]**

### **B.Sc. Part-I, Semester-I**

#### **(Paper-I: Biodiversity of microbes, Algae and Fungi)**

On completion of the course, students are able to:

1. Understand the diversity among Algae.
2. Know the systematic, morphology and structure, the life cycle pattern of Algae.
3. Understand the useful and harmful activities of Algae.
4. Understand the Biodiversity of Fungi
5. Know the Economic Importance of Fungi

#### **(Paper II: Biodiversity of archegoniate)**

On completion of the course, students are able to:

1. Understand the morphological diversity of Bryophytes.
2. Understand the economic importance of the Bryophytes
3. Understand the morphological diversity of Pteridophytes and Gymnosperms.
4. Understand the economic importance of the Pteridophytes and Gymnosperms.
5. Know the evolution of Bryophytes and Pteridophytes and Gymnosperms.

### **B.Sc. Part-I, Semester-II:**

#### **(Paper-III: (Plant Ecology)**

On completion of the course, students are able to:

1. Understand the concept, types, development and functions of various ecosystems and their communication.
2. The various environmental factors governing these ecosystems are also clearly understood.
3. Learn about the ecosystem structure and function, application of these concepts

#### **(Paper IV: Plant Taxonomy)**

On completion of the course, students are able to understand

1. Understand the habit of the angiosperm plant body.
2. Know the vegetative characteristics of the plant.
3. Learn about the reproductive characteristics of the plant.
4. Understand the plant morphology and basic taxonomy.

### **B.Sc. Part-II, Semester- III**

**(Paper-V: Embryology and angiosperm)** On completion of the course, students are able to understand

1. Know the conceptual development of “taxonomy” and systematic”
2. Understand the Phylogeny of angiosperms -A general account of the origin of Angiosperms.
3. Understand the general range of variations in the group of angiosperms.
4. Trace the history of development of systems of classification emphasizing angiosperm taxa.
5. To learn the wide activities in angiosperm and trends in classification.

**(Paper-VI: Plant physiology)** On completion of the course, students are able to understand

1. Know importance and scope of plant physiology.
2. Learn about the movement of sap and absorption of water in plant body. Understand the plant movements. Understand the plants and plant cells in relation to water.
3. Understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways.
4. Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.
5. Learn about the movement of sap and absorption of water in plant body
6. To study the Process of growth and development.

### **B.Sc. Part-II, Semester- IV**

**(Paper-VII: Plant Anatomy)** On completion of the course, students are able to understand

1. Understand the scope & importance of Anatomy.
2. Know various tissue systems.
3. Understand the normal and anomalous secondary growth in plants and their causes.
4. Perform the techniques in anatomy.

**(Paper-VIII: Plant metabolism)** On completion of the course, students are able to understand

1. Structure and general features of enzymes.
2. Concept of enzyme activity and enzyme inhibition.
3. Know about Respiration in plants.
4. Know the nitrogen metabolism and its importance
5. Understand the process of translocation of solutes in plants

### **B.Sc. Part-III, Semester- V**

**(Paper-IX: Genetics and plant breeding)**

On completion of the course, students are able to understand

1. Mendelian and Neo-Mendelian genetics
2. To study the phenomenon of dominance, laws of segregation, independent assortment of genes
3. To understand the different types of genetic interaction, incomplete dominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance etc.
4. Understand the science of plant breeding.
5. To introduce the student with branch of plant breeding for the survival of human being from starvation.
6. To study the techniques of production of new superior crop varieties. Understand the modern strategies applied in Genetics and Plant Breeding to sequence and analyze genomes
7. Get the detail knowledge about modern strategies applied in Plant Breeding for crop improvement i.e. Mass selection, Pureline Selection and Clonal selection.
8. Know about exploitation of Heterosis, hybrid and variety development and their release through artificial hybridization

### **(Paper-X: Microbiology, Plant Pathology and Mushroom technology)**

On completion of the course, students are able to:

1. Understand the concept, principle and types of sterilization methods.
2. Know the concept and characteristics of antiseptic, disinfectant and their mode of action.
3. Know the cultivation methods of bacteria, yeast, fungi and virus.
4. Principle, working and applications of instruments viz, pH meters, spectrophotometer, centrifuge, viscometer, and laminar air flow.
5. Understand the Microbial Genetics and Recombination in Bacteria.
6. Know the terminologies in plant pathology.
7. Understand the scope and importance of Plant Pathology.
8. Know the prevention and control measures of plant diseases and its effect on economy of crops.

### **(Paper-XI: Cytology and research techniques in biology )**

On completion of the course, students are able to:

1. The eukaryotic cell cycle and mitotic and meiotic cell division
2. Structure and organization of cell membrane
3. Process of membrane transport and membrane models
4. On completion of the course, students are able to Gain knowledge about “Cell Science”.
5. Understand Cell wall Plasma membrane, Cell organelles and cell division.
6. Learn the scope and importance of molecular biology
7. Know the details of Microscopy- Principles of light microscopy, electron microscopy (TEM and SEM).
8. Understand & perform Chromatography and cultural techniques in Botany.
9. Understand the methods used in Micrometry, Microtomy and Microphotography.

### **(Paper-XII: Horticulture and gardening)**

On completion of the course, students are able to:

1. To gain knowledge of gardening, cultivation, multiplication, raising of seedlings of ornamental plants
2. Knowledge about agricultural and horticultural crops. Learn about scope and importance, Branches of horticulture; Role in rural economy and employment generation; Importance in food and nutritional security.
3. Learn planning and layout of parks and avenues; gardening traditions; Floriculture.
4. Students acquaint with the methods of plant propagation.

## **B.Sc. Part-III, Semester- VI**

### **(Paper-XIII: Plant biochemistry and molecular biology)**

On completion of the course, students are able to:

1. Understand the properties of Monosaccharide, Oligosaccharides and Polysaccharides.
2. They will learn about the Significance of Carbohydrates.
3. Understand the Properties of saturated fatty acids, and unsaturated fatty acids.
4. Understand lipid metabolism in plants. They will learn about the Significance of lipids.
5. They will be able to understand Brief outline of biosynthesis of amino acid.
6. Understand the protein - structure and classification and protein biosynthesis in prokaryotes and eukaryotes.

7. They will learn about the nucleic acid metabolism. The concept of operon and its structure and regulation

**(Paper-XIV: Bioinformatics, biostatistics and economic botany)** On completion of the course, students are able to:

1. With a working knowledge of the practical and theoretical concepts of bioinformatics, you will be well qualified to progress onto advanced graduate study.
2. The portfolio of skills developed on the programme is also suited to academic research or work within the bioinformatics industry as well as range of commercial settings.
3. After studying Economic Botany, students would have first hand information of plants used as food, the various kinds of nutrients available in the plants.
4. The students will learn to perform the micro-chemical tests to demonstrate various components. The students will teach about the use of fibre plants, beverages, fruits and vegetables that are integral to day to day life of plants. Students will learn to explore the regional diversity in food crops and other plants and their ethno-botanical importance as well.

**(Paper-XV: Plant Biotechnology and Paleobotany)**

On completion of the course, students are able to:

1. Know about the genomic organization or living organisms, study of genes genome, chromosome etc. Gain knowledge about the mechanism and essential component required for prokaryotic DNA replication.
2. Understand the fundamentals of Recombinant DNA Technology.
3. Know about the Genetic Engineering.
4. Understand the principle and basic protocols for Plant Tissue Culture.
5. Know the scope of Paleobotany, types of fossils, its role in global economy and geological time scale.
6. Understand the various fossil genera representing different fossil groups.

**(Paper-XVI: Biofertilizers and herbal drug technology)**

1. The student would have a deep understanding of ecofriendly fertilizers.
2. They will be able to understand the growth and multiplication conditions of useful microbes such as *Rhizobium*, *cyanobacteria*, *Mycorrhizae*, *Azotobactoretc*, their role in mineral cycling and nutrition to plants. They can also think of the methods of decomposition of biodegradable waste and convert into the compost