Program Name: B. Sc. Botany

Program specific Outcomes

A student completing this program will be able to

PSO1: Knowledge: Understanding the nature and basic concepts of all the plant groups, their morpholology, anatomy, taxonomy, physiology, biochemistry, genetics, components at the molecular level, relationship between structure and function, plant diversity and ecology.

PSO2: Laboratory skills: Students learn to carry out practical work in the field and in the laboratory related to interpreting plant morphology and anatomy, plant identification and collection, vegetation analysis techniques, physiochemical analyses of plant materials, analysis of data using appropriate statistical methods, documentation of field visits, visits to gardens and nurseries.

PSO3: Environmental concern: Students become aware of natural resources and understand the impact of the plant diversity in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development with respect to assessment, conservation and utilization of floral diversity.

PSO4: Employability/future prospects: Students develop critical thinking, scientific attitudes, problem-solving skills, presentation skills, team work capacities and an aptitude that is highly valuable to employers in the sector of academia, research and industry and which will facilitate them for taking up and shaping successful careers in Botany.

PSO5: Scientific communication: Effective written and oral scientific communication skills, especially the ability to transmit the fundamental concepts of the subject in a clear and concise manner.

PSO6: Life-long learning: Students are prepared for lifelong learning by drawing attention to the vast world of knowledge of plants and by enhancing their ability to engage in independent learning by introducing them to the methodology of systematic academic enquiry.

Course outcomes for all courses offered by the department:

Semester	Course code	Course name	Course Outcomes Student completing this course is able to

1	BO-1501	Basics of Botany-I	1: Understand the systematic position, distribution, morphology, structural organization and reproduction of Algae, Fungi, Bryophytes and Pteridophytes. They will also increase their awareness and appreciation of human friendly Algae and Fungi and of their economic importance 2: Know the morphology, structure and functions of various parts of plants; learn about various kinds of plant tissues, their general characters and functions, as also know the techniques of staining them.
			3: Be acquainted with basic concepts of Ecology and Environment and will be able to understand the interactions taking place in the Ecosystem and the flow of energy; also they will understand the concept of sustainable biodiversity through a case study. 4: Understand objectives and applications of Ecology. 5: Understand the structure, composition and role of DNA and RNA and learn about their importance and about the processes of replication and protein synthesis.
1	BO-1502L	Basics of Botany Practicals-I	1: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Algae, Fungi, Bryophytes and Pteridophytes. 2: Familiarize with the basic skills and techniques related to plant Morphology, herbarium and Anatomy. 3: Learn about structures, genetic codes, RNA and DNA replication and Protein synthesis through Chart study. 4: Acquire knowledge on Ecology and ecosystems through chart study. 5: Gain knowledge on microscope and type of stains.

2	BO-2501	Basics of Botany-II	1: Differentiate between Gymnosperms and Angiosperms, 2: Understand the life cycles of Cycas, Sunflower and Maize and gain knowledge on Morphology of Angiosperms. 3: Learn about the types of classifications-artificial, Natural and Phylogenetic and know how to classify plants based on Bentham and Hooker's system of Classification. 4: Understand the physiological processes of flowering, respiration and the plant-water related physiological processes. 5: Understand the use of plant resources and the basic concepts of Gardening and be acquainted with technology development in Biotechnology and Plant tissue culture6: Gain knowledge on environmental and biological ethics.

2	BO-2502L	Basics of Botany Practicals-II	1: Perform experimental techniques to analysis selected plants from Gymnosperm and Angiosperm. 2: Understand the distinguishing features and classification of selected Angiosperm families and learn to appreciate their economic importance. 3: Demonstrate experimental technique related to plant physiology. 4: Learn economic botany, garden tools, instrumentation, plant tissue culture, Laboratory design and herbarium technique through cards. 5: Prepare project on the Career opportunities available in any of the branches of Biology.

3	BO-3501	Algae, Fungi, Bryophytes & Plant Pathology	1: Understand unique and general features of Algae and Fungi with respect to their morphology and will be able to differentiate different types of algal and fungal life cycles. 2: Appreciate the economic importance of Lichens and Bryophytes. 3: Obtain an insight into the classification system of Bryophytes and will develop an understanding of affinities of Bryophytes with Algae and Pteridophytes. 4: Understand the external morphology, internal structure and reproduction in Bryophytes. 5: Develop a critical understanding of Plant Pathology w.r.t their classification, symptoms, disease cycles and Control measures.
3	BO-3502	Anatomy, Ecology, Embryology and Cytology	1: Study plant tissues with respect to their internal organs and with respect to normal and anomalous secondary growth. 2: Develop a critical understanding of the evolution of the concept of the organization of the shoot and root apex and appreciate the diversity in the structure and distribution of stomata. 3: Understand core concepts of soil science and of remote sensing and will develop an insight into processes like biological clocks, Bioremediation and Phytoremediation. 4: Assess the adaptation of plants in relation to light, temperature, and water. 5: Explain the structure and development of the Embryo, the male and female gametophyte and develop an understanding of the process of pollination. 6: Classify enzymes, carbohydrates and lipids and will be to analyze the structure, functions and properties of Enzymes.

3	BO-3503L	Lower Plant Diversity-I and II Practicals	1: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Algae, Fungi, Bryophytes and of Plant Pathology. 2:Perform the techniques in Anatomy, Embryology and Ecology (related to the theory syllabus). 3:Perform biochemical tests related to lipids, carbohydrates and enzymes. 4: Acquire knowledge of the theoretical aspects of Embryology through permanent slides. 5: Prepare a research project on any of the topics from the theory sections.
4	BO-4501	Pteridophytes, Gymnosperms & Plant Physiology	1: Examine the morphology, anatomy, reproduction and life cycle of Pteridophyte and Gymnosperm types mentioned in the syllabus. 2: Understand the evolution of Pteridophytes and their transition to land habitat. 3: Identify the economic importance of Gymnosperms. 4: Understand the process of Photosynthesis in plants and explain the significance of various factors affecting this process. 5: Develop an understanding about absorption of water and ascent of sap in plants. 6: Understand plant growth, plant movements, and the process of mineral nutrition in plants.

4	BO-4502	Morphology, Taxonomy, Economic Botany, Palynology, Genetics & Biochemistry	1:Generalize the characters of selected angiosperm families according to Bentham & Hooker's system of classification 2: Develop a basic knowledge of fruit morphology and increase the awareness and appreciation of plants valued as timber, firewood and aromatic species. 3: Understand pollen morphology, viability and germination and identify the applications of Palynology in various industries 4: Have a conceptual understanding of the Principles of Genetics, of gene interaction, of sex determination in plants and of Epitasis. 5: Understand plant geography by studying its objectives and principles and be able to classify and identify forests and biomes. 6: Appreciate the forest wealth and the process of Lac culture and its utility.

4	BO-4503L	Basics Of Botany Practicals-IV (Plant Diversity and Physiology Practicals)	1: Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Pteridophytes and Gymnosperms. 2: Familiarize with the basic skills and techniques related to Plant Physiology. 3: Develop skills to identify plants based on the classification system of Bentham and Hooker. 4: Determine pollen morphology through sample analysis and develop an understanding of the process of pollen development and growth of the pollen tube. 5: Solve problems related to genetics. 6: Analyze types of forests found in India and types of biomes of the world as well as understand the process of lac culture.

5	BO-5401	Production Horticulture	1: Understand the Fundamentals of Horticulture and the different classifications of horticultural crops. 2: Understand and appreciate the importance of Soil with respect to its formation and the role of nutrients, fertilizers and water. 3: Evaluate the various methods of Plant Propagation and Plant protection. 4: Gain Knowledge on Green house cultivation, packaging and modern strategies of marketing and conservation.
5	BO-5501	Algae, Fungi, Bryophytes, Pteridophytes	1: Differentiate between various groups of Algae and know their role in human welfare as well as understand the lifecycles of selected groups. 2: Know the occurrence and distribution and will understand the structure, reproduction and life histories of selected Fungi. 3: Gain knowledge on mushroom cultivation and will understand the evolution of the Sporophyte in Bryophytes. 4: Distinguish various bryophytes and learn about their life cycles and know about the adaptive features of Bryophytes as land plants. 5: Classify Pteridophytes based on Reimer's classification and will understand the structure, reproduction and life history of the selected Pteridophyte groups.
5	BO-5502	Systematic Botany, Angiosperms, Embryology and Anatomy	1: Comprehend the principles and rules of ICBN and will gain knowledge on Engler and Prantle's system of classification.

			2: Gain Knowledge on Plant nomenclature and will understand herbarium techniques and botanical keys as also appreciate the role of Herbaria and Botanical gardens. 3: Describe the morphology, classification, distinctive features and economic importance of 9 selected Angiosperm families. 4: Understand the concepts of Apomixis, Polyembryony and Sexual incompatibility and will learn about the different types of endosperms and their functions. 5: Learn about secretory and absorbing tissue systems and along with it they will know about mineral crystals deposited in plant cells and understand the phenomenon of leaf fall. 6: Study about Applied Plant Anatomy and Embryology and understand about Root – stem transition.
5	BO-5503	Palnt Physiology, Biochemistry, Cell Biology, Genetics	1: Understand the concept of R.Q, growth correlations and the basic process of senescence. 2: Assess seed dormancy and germination in plants. 3: Classify amino acids, vitamins and proteins and understand their synthesis, structure and types. 4: Learn about Nitrogen metabolism and Nitrogen fixation and understand the process of lipid metabolism. 5: Gain Knowledge on Cell science with respect to interaction, differentiation, cell cycle and Programmed Cell Death in plants and understand the structure and morphology of Chromosomes. 6: Learn about Linkage, crossing over, mutation. 7: Understand the basics of DNA fingerprinting along with its importance and know about introns and their significance

5	BO-5504	Ecology, Plant Geography, Economic Botany, Biostatistics	1: Comprehend the basic concepts of plant communities, succession, plant indicators and Limiting factors and analyze the different methods of studying plant communities. 2: Understand the concepts of Phytogeography, Endemism, the Continental drift theory and about the Centres of origin.
			3: Study about the botanical regions of India and different vegetation types in Gujarat. 4: Study plants with several economically important uses and will learn domestic preservation methods for pulses and cereals. 5: Analyze the implications of Biometrics and will learn procedures and methods for collection, interpretation and representation of data.
5	BO-5505L	Botany Practicals	1: Make micro preparations of vegetative and reproductive structures of Algae, fungi, bryophytes and pteridophytes (studied in theory). 2: Identify members of the major angiosperm families (from the theory) by observing their diagnostic features and economic importance. 3: Demonstrate exposition and mounting of endosperm, absorbing tissue, secretory tissue, tracheary element and waste materials in plants. 4: Know the process of pollen germination and the phenomenon Leaf fall. 5: Devise methods to improve basic skills and techniques related to plant physiology, biochemistry and ecology. 6: Create basic skills to make cytological preparations and identification of various stages of cell division and to identify charts related to genetics. 7: Solve problems related to genetics and statistics. 8: Acquire knowledge on Economic uses of selected plants. 9: Acquire skills to undertake a field study and present a report along with herbarium sheets and botanical specimens.

6	BO-6401	Plant Tissue Culture	1: Familiarize with a Plant Tissue culture laboratory and the instruments therein. 2: Understand the basic techniques used in plant tissue culture. 3: Know the different types of cultures and understand micropropagation. 4: Appreciate the applications of plant tissue culture.
6	BO-6501	Pteridophytes, Gymnosperms, Paleobotany,	1: Distinguish various Pteridophytes based on their structure, reproduction and life history and
		Histochemical Methods and Techniques	also distinguish between Apospory and Apogamy. 2: Learn about the structure of Microspores and male gametophytes in Gymnosperms and will appreciate the Indian contribution to Gymnosperms. 3: Understand the morphology, anatomy, reproduction and life history of selected Gymnosperms. 4: Know about the evolution of Pteridophytes and study the general characters of fossil Pteridophytes belonging to Psilophytales, Lepidodendrales and Calamitales. 5: Learn about basic concepts of histochemical methods and techniques and will be acquainted with the basics of killing and fixing.
6	BO-6502	Systematic Botany, Angiosperms, Anatomy, Microbiology	1: Analyze selected methods and their principles of classification and evaluate the contributions of the BSI and interdisciplinary approaches to the advancement of plant taxonomy. 2: Identify members of the major angiosperm families by observing their diagnostic features and economic importance. 3: Understand the Process of Normal and Anomalous Secondary thickening in selected Plants. 4: Understand the concept of nodal anatomy. 5: Understand the basics of Bacteria and Viruses and appreciate role of microbes in various fields.

6	BO-6503	Plant Physiology, Bioinformatics, Plant Breeding, Molecular Biology, Biotechnology	1: Acquire basic knowledge about different plant growth regulators, plant movements and understand the physiological changes in plants during stress conditions. 2: Understand the history and current developments in the field of Biotechnology and Bioinformatics and understand the repositories of Biological Data Knowledge. 3: Understand the basic concepts of plant breeding and learn the various techniques related to selection, hybridization and breeding. 4: Know about techniques of gene mapping, DNA sequencing, gene transfer and cryopreservation

			and know about molecular markers and their applications. 5: Understand the biohazards of Recombinant DNA Technology and appreciate the applications of biotechnology.
6	BO-6504	Environmental Biology, Gardening, Ethnobotany, Forestry	1: Familiarize with the major environmental problems like global warming, pollution, extinction and climate changes: their causes and potential solutions. 2: Understand the concepts of plant biodiversity and of Carbon footprint. 3: Understand the principles of gardening, garden design and care, landscaping and nursery management. 4: Evaluate the history and development of Ethnobotany while appreciating the role of sacred groves and the significance of selected ethnomedicinal plants. 5: Learn about methods of ethnobotanical research and conservation. 6: Appreciate the types of forests in India, as well as forest products like wood, paper, lac, etc and to know about Forestry related institutes and laws,

6	BO-6505L	Botany Practicals	1: Examine the classification, distribution, morphology, anatomy, reproduction and life cycle of Pteridophyte and Gymnosperm types mentioned in the syllabus. 2: Identify fossils of Pteridophytes and Gymnosperms. 3: Recognize members of the major Angiosperm families (studied in theory) by identifying their diagnostic features and economic importance. 4: Demonstrate anomalous secondary growth in specified plant materials. 5: Equip students with skills and techniques related to plant physiology and ecology so that they can design their own experiments. 6: Demonstrate microbiological techniques and herbarium preparation techniques. 7: Learn about plant breeding, molecular biology, ethnobotany, gardening and biotechnology through charts.
			8: Prepare and submit personal reports of visits to a Garden, a Nursery, tour along with herbarium preparations and permanent slides.