

**PROGRAMME SPECIFIC OUTCOMES, PROGRAMME OUTCOMES AND COURSE OUTCOMES**

**PG DEPARTMENT OF BOTANY**

**B.Sc., BOTANY, EXTRA-CREDIT COURSES & VALUE-ADDED COURSES**

**PSO, PO & CO STATEMENTS / 2023 - 2026**

<b>PSOs</b>	<b>PROGRAMME SPECIFIC OUTCOMES</b>
PSO1	Acquire good knowledge and understanding, to solve specific theoretical & practical problems in different area of Botany
PSO2	Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.
PSO3	To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations
PSO4	Developing a research framework and presenting their independent ideas effectively
PSO5	Equipping their employability skills to excel in professions like teaching and exposing them to various activities to empower them through communication skills
PSO6	Enabling a holistic perspective towards the socio-political inequalities and environmental issues.

**B.Sc., BOTANY**

**B.Sc., BOTANY / PROGRAMMES OUTCOMES**

<b>POs</b>	<b>Description of POs</b>
PO1	Develop a broad fundamental knowledge of the plant diversity especially habit, habitat ,morphology, adaptations and classification of plant kingdom.
PO2	Analyze the relationship between plants, animals, microbes and deal with the local national global environment issues by realizing the right of the individuals and also need to conserve our biosphere.
PO3	Understand how organisms function at the level of gene, genome, cell tissue, thallus, plant body drawing upon this knowledge, they are able to give specific examples of the physiological adaptations developed, reproduction and behavior of different forms of life.

PO4	Gain knowledge about the application of biological sciences in mushroom cultivation, azolla cultivation, nursery management, herbal garden management, pest management, there by impart skill as well a source of income and self employment .
PO5	Generate innovative ideas for performing experiments in the areas of biochemistry, physiology, genetics, microbiology, Developmental biology, anatomy, taxonomy, economic botany, and ecology.
PO6	Explain the recent developments in genetic engineering, biotechnology, microbiology, for research activities in the department or in collaboration with other research institutions.
PO7	Organize and deliver relevant applications of knowledge through effective written verbal, graphical/virtual communications and interact with people from diverse back ground.

**B.Sc., BOTANY / COURSE OUTCOMES**

	<b>Description of COs</b>	<b>Bloom's Taxonomy / Cognitive Domain</b>
<b>Plant Diversity- I Algae</b>		
CO1.	Relate to the structural organization, reproduction and significance of algae.	K1
CO2.	Demonstrate knowledge in understanding the various life cycle patterns and the fundamental concepts in algal growth	K2
CO3.	Explain the benefits of various algal technologies on the ecosystem.	K3
CO4.	Compare and contrast the thallus organization and modes of reproduction in algae.	K4
CO5.	Determine the emerging areas of Algal Biotechnology for identifying commercial potentials of algal products and their uses.	K5
<b>Plant Diversity- I Algae Practical</b>		
CO1.	Recall and identify algae using key identification characters.	K1
CO2.	Demonstrate practical skills in preparation of fresh mount and identification of algal forms from algal mixture.	K2
CO3.	Describe the internal structure of algae prescribed in the syllabus	K3
CO4.	Decipher the algal diversity in fresh/marine water and their economic significance.	K4
CO5	Evaluate the various techniques used to culture algae for commercial purposes	K5

<b>Elective Allied Botany-I</b>		
CO1.	Increase the awareness and appreciation of human friendly algae and their economic importance.	K1
CO2.	Develop an understanding of microbes and fungi and appreciate their adaptive strategies	K2
CO3.	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K3
CO4.	Compare the structure and function of cells and explain the development of cells.	K4
CO5.	Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.	K5
<b>Nursery and Landscaping</b>		
CO1.	Recognize the basic principles and components of gardening.	K1
CO2.	Explain about bio-aesthetic planning and conceptualize flower arrangement.	K2
CO3.	Apply techniques for design various types of gardens according to the culture and art of bonsai.	K3
CO4.	Compare and contrast different garden styles and landscaping patterns.	K4
CO5.	Establish and maintain special types of gardens for outdoor and indoor landscaping.	K5
<b>Basics of Botany</b>		
CO1.	1. Increase the awareness and appreciation of human friendly algae and their economic importance.	K1
CO2.	2. Develop an understanding of microbes and fungi and appreciate their adaptive strategies	K2
CO3.	3. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K3
CO4.	4. Compare the structure and function of cells and explain the development of cells.	K4
CO5.	5. Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.	K5
<b>Plant Diversity- II Fungi, Bacteria, Viruses, Plant pathology and Lichens</b>		
CO1.	Recognize the general characteristics of microbes, fungi and lichens and disease symptoms.	K1
CO2.	Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies based on structural organization.	K2
CO3.	Identify the common plant diseases, according to geographical locations and devise control measures.	K3
CO4.	Analyze the emerging trends in fungal biotechnology with special reference to agricultural and pharmaceutical applications.	K4
CO5.	Determine the economic importance of microbes, fungi and lichens.	K5
<b>Plant Diversity- II Fungi, Bacteria, Viruses, Plant pathology and Lichens Practical II</b>		
CO1.	Identify microbes, fungi and lichens using key identifying characters	K1
CO2.	Develop practical skills for culturing and cultivation of fungi.	K2

CO3.	Identify and select suitable control measures for the common plant diseases.	K3
CO4.	Analyze the characteristics of microbes, fungi and plant pathogens	K4
CO5.	Access the useful role of fungi in agriculture and pharmaceutical industry.	K5
<b>Allied Botany-II</b>		
CO1.	Understand the fundamental concepts of plant anatomy and embryology.	K1
CO2.	Analyze and recognize the different organs of plants and secondary growth.	K2
CO3.	Understand water relation of plants with respect to various physiological processes.	K3
CO4.	Classify aerobic and anaerobic respiration.	K4
CO5.	Classify plant systematics and recognize the importance of herbarium and virtual herbarium.	K5
<b>Allied Botany Practicals</b>		
CO1.	To study the internal organization of algae and fungi.	K1
CO2.	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms..	K2
CO3.	To study the classical taxonomy with reference to different parameters.	K3
CO4.	Understand the fundamental concepts of plant anatomy and embryology	K4
CO5.	To study the effect of various physical factors on photosynthesis.	K5
<b>Mushroom Cultivation</b>		
CO1.	Recall various types and categories of mushroom.	K1
CO2.	Explain about various types of food technologies associated with mushroom industry.	K2
CO3.	Apply techniques studied for cultivation of various types of mushroom.	K3
CO4.	Analyze and decipher the environmental factors and economic value associated with mushroom cultivation	K4
CO5.	Develop new methods and strategies to contribute to mushroom production.	K5 & K6
<b>Botanical Garden and Landscaping</b>		
CO1.	Recognize fundamental concepts of gardening and landscaping.	K1
CO2	Explain about significance of garden adornments and propagation structures.	K2
CO3	Apply techniques of landscaping for aesthetic purposes and gardening for recreation.	K3
CO4	Distinguish between formal, informal and free style gardens and their applications.	K4
CO5	Develop and design outdoor and indoor gardens and inculcate entrepreneurial skills for landscaping.	K5 & K6
<b>Plant Diversity- III Bryophytes and Pteridophytes</b>		
<b>CO1</b>	Recognize morphological variations of Bryophytes and Pteridophytes.	K1
<b>CO2</b>	Explain the anatomy and reproduction of Bryophytes and Pteridophytes.	K2
<b>CO3</b>	Compare and contrast the variations in the internal cellular organization, gametophyte and sporophyte of Bryophytes and Pteridophytes.	K3

CO4	Decipher the stages of plant evolution and their transition to land habitat.	K4
CO5	Access the useful role of Bryophytes and Pteridophytes.	K5
<b>Plant Diversity- III Bryophytes and Pteridophytes Practical III</b>		
CO1	Recognize the major groups of Non-vascular and Vascular cryptogams	K1
CO2	Describe the structure of Bryophytes and Pteridophytes forms prescribed in the syllabus.	K2
CO3	Identify and illustrate the morphological and anatomical features of bryophytes and Pteridophytes.	K3
CO4	Develop comprehensive skills in sectioning and micro preparation.	K4
CO5	Interpret the significance of reproductive structures in Bryophytes and Pteridophytes.	K5
<b>Entrepreneurial Opportunities in Botany</b>		
CO1	Relate to how various fields of botany could be understood with an entrepreneurial approach.	K1
CO2	Explain the concept of Entrepreneurial Opportunities in Botany.	K2
CO3	Make of the knowledge gained to start new venture using Plant tissue culture and plant products for commercial exploitations	K3
CO4	Decipher effective ways of making bioproducts like organic acids, solvents, beverages, enzymes, antibiotics, mushrooms, biogas and etc.	K4
CO5	Develop new strategies to describe marketing and business management strategy including the role of IPR and bioethics regulations for licensing.	K5 & K6
<b>Herbal Technology</b>		
CO1	Define and describe the principle of cultivation of herbal products.	K1
CO2	List the major herbs, their botanical name and chemical constituents.	K2
CO3	Apply techniques for monitoring drug adulteration through the biological testing.	K3
CO4	Analyze and decipher the significance of various methods of harvesting, drying and storage of medicinal herbs.	K4
CO5	Develop the skills for cultivation of plants and their value added processing / storage	K5 & K6
<b>Plant diversity IV- Gymnosperms, Paleobotany and Evolution</b>		
CO1	Relate to the general characteristics of Gymnosperms and fossil forms	K1
CO2	Explain about the morphology and anatomy Gymnosperms.	K2
CO3	Compare and contrast the reproductive structures of Gymnosperms & fossil forms.	K3
CO4	Analyze the anatomy and reproduction Gymnosperms along with their ecological and economical importance.	K4
CO5	Determine the various fossilization methods and their significance in paleobotany.	K5
<b>Plant diversity IV- Gymnosperms, Paleobotany and Evolution Practical IV</b>		
CO1	Analyze and observe and record the morphological features of selected species of Gymnosperms..	K1

<b>CO2</b>	Describe the structure of fossil forms prescribed in the syllabus.	K2
<b>CO3</b>	Identify and Illustrate the morphological and anatomical features of gymnosperms.	K3
<b>CO4</b>	Develop comprehensive skills in sectioning and micro preparation.	K4
<b>CO5</b>	Interpret the significance of reproductive structures in gymnosperms.	K5
<b>Fermentation Technology</b>		
<b>CO1</b>	Enumerate the significance of industrially useful microbes.	K1
<b>CO2</b>	Explain the design and operation of industrial practices in mass production of fermented products.	K2
<b>CO3</b>	Explain the process of maintenance and preservation of microorganisms.	K3
<b>CO4</b>	Analyze the various aspects of the fermentation technology and apply for fermentative production.	K4
<b>CO5</b>	Validate the experimental techniques for microbial production of enzymes: amylase and protease, bio product recover.	K5 & K6
<b>Environmental Impact Analysis</b>		
<b>CO1</b>	Enumerate the fundamental concepts and significance of environmental impact assessment.	K1
<b>CO2</b>	Explain the important steps of EIA process.	K2
<b>CO3</b>	Interpret the environmental appraisal and procedures in India.	K3
<b>CO4</b>	Decipher how to prepare the various documents required by state and federal regulations.	K4
<b>CO5</b>	Develop their own perspectives on impact assessment and be able to solve problems related to environment.	K5 & K6
<b>Plant Morphology, Taxonomy and Economic Botany</b>		
<b>CO1</b>	Define the concepts in plant morphology and rules of IUCN in botanical nomenclature.	K1
<b>CO2</b>	Classify systems of plant classification and recognize the importance of herbarium and virtual herbarium.	K2
<b>CO3</b>	Describe the core concepts of economic Botany and relate its applications in human life.	K3
<b>CO4</b>	Analyze the characters of the families according to the Bentham and Hooker's system of classification.	K4
<b>CO5</b>	Assess terms and concepts related to Phylogenetic Systematics.	K5
<b>Plant Morphology, Taxonomy and Economic Botany Practical V</b>		
<b>CO1</b>	Recognize the distinguishing plant morphological characters.	K1
<b>CO2</b>	Identify locally available plants to their respective families.	K2
<b>CO3</b>	Develop comprehensive skills in field identification, collection of specimens, writing technical description, botanical drawings and herbaria preparation.	K3
<b>CO4</b>	Construct floral diagram and write floral formula for a given flower.	K4
<b>CO5</b>	Validate the plant specimen by analyzing and dissecting the vegetative and floral characters.	K5

<b>Plant Anatomy and Embryology</b>		
<b>CO1</b>	Relate to the fundamental concepts of plant anatomy and embryology.	K1
<b>CO2</b>	Describe the internal tissue organization of various plant organs.	K2
<b>CO3</b>	Elucidate the stages of normal and abnormal secondary growth.	K3
<b>CO4</b>	Compare the structural organization of flower in relation to the process of pollination and fertilization.	K4
<b>CO5</b>	Access the various anatomical adaptations in plants.	K5
<b>Bio-Analytical Techniques</b>		
<b>CO1</b>	Relate to the various biological techniques and its importance.	K1
<b>CO2</b>	Explain the principles of Light microscopy, compound microscopy, Fluorescence microscopy and electron microscopy.	K2
<b>CO3</b>	Apply suitable strategies in data collections and disseminating research findings.	K3
<b>CO4</b>	Compare and contrast the significance of different types of chromatography techniques.	K4
<b>CO5</b>	Develop methodologies for extraction and analysis of biochemical compounds.	K5
<b>Aquatic Botany</b>		
<b>CO1</b>	Recognize aquatic plants and their ecological importance.	K1
<b>CO2</b>	Explain about commonly occurring marine and limnetic algae of the Indian coasts.	K2
<b>CO3</b>	Apply techniques for conservation of aquatic plants for value addition.	K3
<b>CO4</b>	Analyze and decipher the significance and properties of mangroves, other aquatic angiosperms and microalgae.	K4
<b>CO5</b>	Develop new strategies to conserve mangroves and devise innovative methods for cultivation of aquatic plants.	K5 & K6
<b>Entrepreneurial Botany</b>		
<b>CO1</b>	Recognize the significance of government agencies for entrepreneurship development.	K1
<b>CO2</b>	Explain about entrepreneurial values, risk assessment and solutions	K2
<b>CO3</b>	Make use of entrepreneurial opportunities.	K3
<b>CO4</b>	Analyze and decipher the significance of bioventure and value added products.	K4
<b>CO5</b>	Devise innovative methods for making value added products.	K5 & K6
<b>Forestry</b>		
<b>CO1</b>	Relate to the basic concepts related to forest distribution, degradation, protection, management and resource utilization.	K1
<b>CO2</b>	Understand complex interactions of humans and forest ecosystems in a global context.	K2
<b>CO3</b>	Demonstrate skills for ecological measurements and interpretation of forest ecology management.	K3

CO4	Examine and decipher the factors influencing forest vegetation, forest degradation and methods of wood preservation	K4
CO5	Develop new strategies and apply the knowledge gained for problem-solving analysis in the conservation and management of forest ecosystems.	K5 & K6
<b>Biodiversity Conservation and Management</b>		
CO 1	Impart knowledge about environment.	K1
CO 2	Students understand the natural resources.	K2
CO 3	Understand the threats and natural calamities.	K3
CO 4	Develop knowledge in understanding biodiversity and its conservation.	K4
CO5	Understand the environment, In situ and Ex situ Conservation.	K5 & K6
<b>Plant Ecology and Phytogeography</b>		
CO 1	Relate to the significance of the biotic and abiotic components of the ecosystems and energy flow.	K1
CO 2	Summarize the phytogeographical division of India.	K2
CO 3	Explain the implication of pollution on the environment.	K3
CO 4	Analyze the implications of functional and behavioral ecology in natural and man-made areas, biodiversity and conservation.	K4
CO5	Develop mitigations for the effective conservation of biodiversity and disaster management.	K5
<b>Plant Biotechnology and Molecular biology</b>		
CO1	Recognize the fundamentals concepts of plant biotechnology and genetic engineering.	K1
CO2	Explain various steps in transcription, protein synthesis and protein modification.	K2
CO3	Elucidate gene cloning and evaluate different methods of gene transfer.	K3
CO4	Analyze the major concerns and applications of transgenic technology.	K4
CO5	Develop their competency on different types of plant tissue culture.	K5
<b>Plant Physiology and Plant Biochemistry</b>		
CO1	Relate to water relation of plants with respect to various physiological phenomenon.	K1
CO2	Explain the process and significance of photosynthesis and respiration.	K2
CO3	Elucidate properties of nutrients and their deficiency symptoms in plants.	K3
CO4	Analyze the biological role of plant growth regulators, carbohydrates, proteins, lipids, nucleic acids and enzymes.	K4
CO5	Decipher the phenomenon of seed dormancy and germination in plants.	K5
<b>Core XIV, XV and XVI - Practical-VII</b>		
CO1	Relate to the distribution and adaptations of plants pertaining to their habitat	K1
CO2	Demonstrate skills in green planning and callus culture.	K2
CO3	Elucidate the basic principles involved in the plant physiology and biochemistry experiments.	K3



CO4	Appreciate the structure and functions of DNA and RNA.	K4
CO5	Estimate the biochemical components and determine the factors controlling photosynthesis and transpiration of plants.	K5
<b>Horticulture</b>		
CO1	Enumerate the concepts in horticulture and nursery management.	K1
CO2	Demonstrate a working knowledge on biology of soil, compost making, designing and planning of garden, pest, diseases and nutrient management practices.	K2
CO3	Appraise the importance of floriculture and evaluate the contribution of spices and condiments on economy.	K3
CO4	Analyze different methods of weed control in horticultural crops.	K4
CO5	Develop their competency on pre and post-harvest technology in horticultural crops.	K5 & K6
<b>Natural Resource Management</b>		
CO1	Relate to significance of natural resources pertaining to economy and environment	K1
CO2	Understand the concept of different natural resources and their utilization.	K2
CO3	Evaluate the management strategies of different natural resources.	K3
CO4	Critically analyze the sustainable utilization land, water, forest and energy resources.	K4
CO5	Design new models of natural resource conservation and maintenance.	K5 & K6
<b>Forensic Botany</b>		
CO1	Recognize morphological and anatomical features of plants, which could be useful for forensic investigations.	K1
CO2	Summarize the forensic importance of different parts of plants.	K2
CO3	Apply techniques for the collection and preserve of botanical evidences of crime.	K3
CO4	Analyze and decipher the significance of classic and DNA based forensic botany cases.	K4
CO5	Interpret and deduce new methods for the detection of plant poisons used in crime.	K5 & K6
<b>Bionanotechnology</b>		
CO1	Relate to the essential features of biology and nanotechnology that are converging to create the new area of bionanotechnology	K1
CO2	Explain the synthesis of nanomaterials and their applications.	K2
CO3	Apply the knowledge gained to develop nanomaterials	K3
CO4	Compare the advantages and disadvantages of nanoparticles in health, medicine and environment.	K4
CO5	Construct various types of nanomaterial for application and evaluate the impact on environment.	K5 & K6
<b>Botany For Competitive Examinations</b>		
CO1	Identify and define different groups of plants with their taxonomic position Compare the different groups of plants and evaluate their economic importance	K1

CO2	List down the general characters of Bryophytes, Pteridophytes and Gymnosperms Classify the types of fossils and recognize the fossil beds of Tamil Nadu Analyse and trace the origin of different plant groups using Geological Time scale	K2
CO3	Appreciates the morphology of plant and analyse different modifications of plant organs. Explore the major Herbaria of the world and recognize the importance.	K3
CO4	Differentiate Prokaryotic and Eukaryotic cell. Evaluate the significance of cell division. Justify the cause for the sex linked inheritance. Tabulate the different cell organelles with their functions.	K4
CO5	Define and appreciates biodiversity. Identify the cause and solve environmental related issues . Design eco friendly approaches to protect earth and generate new conservation strategies.	K5 & K6
<b>Extra Credit Papers</b>		
<b>Extra Credit Paper I – Dietary and Nutritional Value of Fruits and Vegetables</b>		
CO1	Impart knowledge about balanced diet.	K1
CO2	Students understand the functions of food.	K2
CO3	Understand the nutritional classification of foods.	K2
CO4	Develop knowledge in understanding the diet for various deficiencies.	K2
CO5	Understand the allergic and non allergic foods.	K3
<b>Extra credit paper II - Commercial Plant Products</b>		
CO1	Impart knowledge about balanced diet.	K1
CO2	Students understand the functions of food.	K2
CO3	Understand the nutritional classification of foods.	K2
CO4	Develop knowledge in understanding the diet for various deficiencies.	K2
CO5	Understand the allergic and non allergic foods.	K3
<b>Extra Credit Paper III – Biodiversity Conservation and Management</b>		
CO1	Impart knowledge about environment.	K1
CO2	Students understand the natural resources.	K2
CO3	Understand the threats and natural calamities.	K2
CO4	Develop knowledge in understanding biodiversity and its conservation.	K2
CO5	Understand the environment, In situ and Ex situ Conservation.	K3
<b>Value Added Course</b>		
<b>Value Added Course I - Organic Farming</b>		
CO1	Understands the merits of organic farming over conventional farming	K1

<b>CO2</b>	Students learn the preparation of various organic manures and panchakavya	K2
<b>CO3</b>	Imparts knowledge to analyse the water and weed management practices	K2
<b>CO4</b>	Understands to prepare herbal pest repellents	K2
<b>CO5</b>	Students gain knowledge by visiting organic farms	K5
<b>Value Added Course II - Landscape Gardening</b>		
<b>CO1</b>	Understands the merits of garden designing	K1
<b>CO2</b>	Students learn the various components of garden	K2
<b>CO3</b>	Imparts knowledge about the soil, organic and inorganic fertilizers	K2
<b>CO4</b>	Understands the propagation and plant protection	K2
<b>CO5</b>	Students gain knowledge by visiting different landscapes	K5
<b>Value Added Course III – Terrace Gardening</b>		
<b>CO1</b>	Understands the importance of terrace garden	K1
<b>CO2</b>	Students learn the preparation of potting mixture	K2
<b>CO3</b>	Imparts knowledge to grow bonsai plants	K2
<b>CO4</b>	Understands to maintain the shade houses	K2
<b>CO5</b>	Students gain knowledge by visiting many roof gardens	K5

**PROGRAMME SPECIFIC OUTCOMES, PROGRAMME OUTCOMES AND COURSE OUTCOMES**

**PG DEPARTMENT OF BOTANY**

**M.Sc., BOTANY**

**PSO, PO & CO STATEMENTS / 2023 - 2025**

<b>PSOs</b>	<b>PROGRAMME SPECIFIC OUTCOMES</b>
<b>PSO1 Placement</b>	To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.
<b>PSO2 Entrepreneur</b>	To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.
<b>PSO3 Research and Development</b>	Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.
<b>PSO4 Contribution to Business World</b>	To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
<b>PSO 5 – Contribution to the Society</b>	To contribute to the development of the society by collaborating with stakeholders for mutual benefit

**M.Sc., BOTANY**

**M.Sc., BOTANY PROGRAMME OUTCOMES**

<b>POs</b>	<b>Description of COs</b>
PO1	Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.
PO2	Foster analytical and critical thinking abilities for data-based decision-making.
PO3	Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.

PO4	Ability to develop communication, managerial and interpersonal skills.	
PO5	Capability to lead themselves and the team to achieve organizational goals.	
PO6	Inculcate contemporary business practices to enhance employability skills in the competitive environment.	
PO7	Equip with skills and competencies to become an entrepreneur.	
PO8	Succeed in career endeavors and contribute significantly to society.	
PO9	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.	
PO10	Ability to embrace moral/ethical values in conducting one's life.	
<b>M.Sc., BOTANY / COURSE OUTCOMES</b>		
	<b>Description of COs</b>	<b>Bloom's Taxonomy / Cognitive Domain</b>
<b>Semester I:</b>		
<b>CORE I: PLANT DIVERSITY – I: ALGAE, FUNGI, LICHENS AND BRYOPHYTES</b>		
<b>CO1</b>	Relate to the structural organizations of algae, fungi, lichens and Bryophytes.	K1
<b>CO2</b>	Demonstrate both the theoretical and practical knowledge in understanding the diversity of basic life forms and their importance.	K2
<b>CO3</b>	Explain life cycle patterns in algae, fungi, lichens and Bryophytes.	K3
<b>CO4</b>	Compare and contrast the mode of reproduction in diverse groups of basic plant forms.	K4
<b>CO5</b>	Discuss and develop skills for effective conservation and utilization of lower plant forms.	K5 & K6
<b>CORE II- PLANT DIVERSITY – II (PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY)</b>		
<b>CO1</b>	Recall on classification, recent trends in phylogenetic relationship, general characters of Pteridophytes and Gymnosperms.	K1
<b>CO2</b>	Learn the morphological/anatomical organization, life history of major types of Pteridophytes and Gymnosperms.	K2
<b>CO3</b>	Comprehend the economic importance of Pteridophytes, Gymnosperms, and fossils.	K3
<b>CO4</b>	Understanding the evolutionary relationship of Pteridophytes and Gymnosperms.	K4
<b>CO5</b>	Awareness on fossil types, fossilization and fossil records of Pteridophytes and Gymnosperms.	K5 & K6
<b>CORE-III : LABORATORY COURSE-I COVERING THEORY PAPERS I AND II</b>		
<b>CO1</b>	Recall and applying the basic keys to distinguish at species level identification of important algae and	K1

	fungi through its structural organizations.	
<b>CO2</b>	Demonstrate practical skills in thallophytes, Pteridophytes and Gymnosperms.	K2
<b>CO3</b>	Describe the structure of algae, fungi, lichens, Bryophytes, Pteridophytes and Gymnosperms.	K3
<b>CO4</b>	Determine the importance of structural diversity in the evolution of plant forms.	K4
<b>CO5</b>	Formulate techniques to isolate and culture of alga and fungi as well as to understand the diversity of plant forms.	K5 & K6
<b>ELECTIVE I - MUSHROOM CULTIVATION</b>		
<b>CO1</b>	Knowledge on identification of edible and toxic mushrooms belonging to Ascomycota and Basidiomycota.	K1, K3
<b>CO2</b>	Outline the nutraceutical properties of edible mushrooms.	K2, K4
<b>CO3</b>	Knowledge on cultivation techniques of edible and medicinal mushrooms.	K3, K6
<b>CO4</b>	Understand the harvest and post-harvest techniques of mushroom crops.	K4
<b>CO5</b>	Knowledge on the production and marketing strategies for mushrooms.	K5
<b>ELECTIVE I: PHYTOPHARMACOGNOSY</b>		
<b>CO1</b>	Review on the traditional knowledge and classification of plant derived drugs.	K1
<b>CO2</b>	Knowledge on biosynthetic pathway of different classes of plant metabolites.	K2
<b>CO3</b>	Knowledge on modern instrumentation on characterization of plant metabolites.	K3, K6
<b>CO4</b>	Discuss various aspects of Pharmacological action of herbal drugs.	K4 K5
<b>CO5</b>	Understanding medical and non-medical potential of plant derived in various sectors.	K6
<b>ELECTIVE II - HORTICULTURE</b>		
<b>CO1</b>	Identify and categorize various horticultural plants and the conditions that affect their growth and productivity.	K1
<b>CO2</b>	Explain the various structures and growth processes of horticultural plants.	K2
<b>CO3</b>	Demonstrate the propagation, growth, and maintenance of plants in horticulture systems.	K3, K6
<b>CO4</b>	Correlate the soil characteristics and fertility to good plant growth.	K4 K5
<b>CO5</b>	Utilize the role plant tissue culture techniques in the production of quality planting stock in horticulture.	K6
<b>ELECTIVE-II HERBAL TECHNOLOGY</b>		
<b>CO1</b>	Recollect the importance of herbal technology.	K1
<b>CO2</b>	Understand the classification of crude drugs from various botanical sources.	K2
<b>CO3</b>	Analyze on the application of secondary metabolites in modern	K3

	medicine.	
<b>CO4</b>	Create new drug formulations using therapeutically valuable phytochemical compounds for the healthy life of society.	K4
<b>CO5</b>	Comprehend the current trade status and role of medicinal plants in socio economic growth.	K5 & K6

<b>Semester- II</b>		
<b>CORE-IV TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY</b>		
<b>CO1</b>	Recollect the basic concepts of morphology of leaves, flowers. Identify the types of compound leaves , inflorescence and fruits Describe their characteristic features	K1, K2 K3
<b>CO2</b>	Explain the principles of taxonomy. Summarize the taxonomic hierarchy. Define Binomial nomenclature. Group Activity –Construct key preparation	K1, K2 K5, K6
<b>CO3</b>	Explain the various types of classification. Distinguish its advantages and disadvantages Construction of floral formula anf floral diagram.	K1, K2 K3, K4
<b>CO4</b>	Illustrate and explain the characteristic features and list out the economic importance of the families Field trip to local botanical garden and regional botanical garden.	K1, K2 K3, K4
<b>CO5</b>	Illustrate and explain the characteristic features and list out the economic importance of the families.	K1, K2 K3, K5
<b>CORE-V PLANT ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS</b>		
<b>CO1</b>	Learn the structures, functions and roles of apical vs lateral meristems in monocot and dicot plant growth.	K1& K2
<b>CO2</b>	Study the function and organization of woody stems derived from secondary growth in dicot and monocot plants.	K1&K4
<b>CO3</b>	Apply their idea on sectioning and dissection of plants to demonstrate various stages of plant development.	K2& K6
<b>CO4</b>	Understand the various concepts of plant development and reproduction.	K3& K6
<b>CO5</b>	Profitably manipulate the process of reproduction in plants with a professional and entrepreneurial mindset.	K5
<b>CORE-VI LABORATORY COURSE-II COVERING PAPERS IV&amp; V</b>		
<b>CO1</b>	To gain recent advances in plant morphological and floral characteristics.	K1
<b>CO2</b>	Understand about different floral characteristics and artificial key preparation which employed for plant identification and conservation.	K2
<b>CO3</b>	Recall or remember the information including basic and advanced in relation with plant anatomy and	K4 & K5

	embryology.	
<b>CO4</b>	Apply their idea on sectioning and dissection of plants to demonstrate development.	various stages of plant K3
<b>CO5</b>	Know about different vegetation sampling methods.	K3
<b>ELECTIVE-III : RESEARCH METHODOLOGY, COMPUTER APPLICATIONS &amp; BIOINFORMATICS</b>		
<b>CO1</b>	Realize the need of centrifuges and chromatography and their uses in Research	K1 &K2
<b>CO2</b>	Learn the principles and applications of electrophoresis.	K2 &K3
<b>CO3</b>	Construct the phylogenetic trees for similar characteristic feature of plant genomes and study <i>de novo</i> drug design through synthetic biology.	K5 &K6
<b>CO4</b>	Understand the concept of pairwise alignment of DNA sequences using algorithms.	K3 &K4
<b>CO5</b>	Interpret the features of local and multiple alignments.	K4 &K5
<b>ELECTIVE-III: BIOPESTICIDE TECHNOLOGY</b>		
<b>CO1</b>	Understand the issues in use of chemical pesticides and their harmful effects on life.	K1 & K2
<b>CO2</b>	Aware the significance of biopesticides and their beneficial role in controlling insect pests, diseases, nematodes and weeds.	K1 & K4
<b>CO3</b>	Knowledge on identification of promising biopesticides and their mechanisms of action against insect pests, diseases, nematodes and weeds.	K2 & K6
<b>CO4</b>	Learn the mass production and formulation technology of selected biopesticides.	K3 & K6
<b>CO5</b>	Knowledge on product development for commercialization of biopesticides.	K5
<b>ELECTIVE-IV : APPLIED BIOINFORMATICS</b>		
<b>CO1</b>	Familiarize with the tools of DNA sequence analysis.	K1 & K2
<b>CO2</b>	Use and explain the application of bioinformatics.	K2 & K3
<b>CO3</b>	Master the aspects of protein-protein interaction, BLAST and PSI-BLAST.	K3 & K4
<b>CO4</b>	Describe the features of local and multiple alignments.	K3 & K4
<b>CO5</b>	Interpret the characteristics of phylogenetic methods and bioinformatics applications.	K4 & K5
<b>ELECTIVE-IV - INTELLECTUAL PROPERTY RIGHTS</b>		
<b>CO1</b>	Recall the history and foundation of Intellectual Property.	K1
<b>CO2</b>	Understand the differences of Property and Assets and Various Categories of Intellectual Creativity.	K2
<b>CO3</b>	Apply the methods to protect the Intellectual Property.	K3
<b>CO4</b>	Differentiate if the Said Intangible property be protected under law or protected by strategy.	K4
<b>CO5</b>	Create a recommendation document on the methods and procedures of protecting the said IP and search documents to substantiate them.	K5 & K6
<b>SKILL ENHANCEMENT COURSE (SE2)</b>		
<b>AGRICULTURE AND FOOD MICROBIOLOGY</b>		



<b>CO1</b>	Recognize the general characteristics of microbes and factors affecting its Growth	K1
<b>CO2</b>	Explain the significance of microbes in increasing soil fertility	K2
<b>CO3</b>	Elucidate concepts of microbial interactions with plant and food.	K3
<b>CO4</b>	Analyze the impact of harmful microbes in agriculture and food Industry.	K4
<b>CO5</b>	Determine and appreciate the role of microbes in food preservation and as biocontrol.	K5 & K6
<b>INTERNSHIP/INDUSTRIAL ACTIVITY</b>		
<b>CO1</b>	For students in those pertinent core areas, the internship is preparing them to become professionals after graduation.	K1
<b>CO2</b>	Compile data and familiarize yourself with techniques for planning and carrying out tests.	K2
<b>CO3</b>	Collect data and educate yourself on how to analyse results of your scientific studies.	K3 & K5
<b>CO4</b>	This in-the-moment industrial exposure helps them become more knowledgeable and skilled in the latest technology.	K4
<b>CO5</b>	Improving communication skills and coming up with creative ideas are crucial components of training that help someone become an entrepreneur.	K5 & K6
<b>II YEAR SEMESTER III</b>		
<b>CORE VII : CELL AND MOLECULAR BIOLOGY</b>		
<b>CO1</b>	Recall a plant cell structure and explain its function.	K1
<b>CO2</b>	Illustrate and explain the structure of various cell organelles.	K2
<b>CO3</b>	Explain the structure and functional significance of nucleic acid.	K3
<b>CO4</b>	Compare and contrast the DNA replication (prokaryotes and eukaryotes), enzymes involved in replication, DNA repair	K4
<b>CO5</b>	Discuss and develop skills for DNA/gene manipulating and the enzymes involved.	K5 & K6
<b>CORE VIII: GENETICS, PLANT BREEDING &amp; BIOSTATISTICS</b>		
<b>CO1</b>	Understand the Mendal's Law of inheritance and gene interactions.	K1
<b>CO2</b>	Analyze the various factors determining the heredity from one generation to another.	K2
<b>CO3</b>	Explain Gene mapping methods: Linkage maps.	K3
<b>CO4</b>	Compare and contrast the genetic basis of breeding self and cross – pollinated crops.	K4
<b>CO5</b>	Discuss and develop skills for statistical analysis of biological problems.	K5 & K6

<b>CORE IX : LABORATORY COURSE-III (COVERING CORE PAPERS VII AND VIII )</b>		
<b>CO1</b>	Recall or remember the various aspects of cell biology, genetics, molecular biology, plant breeding and tissue culture.	K1
<b>CO2</b>	Understand various concepts of cell biology, genetics, plant breeding and tissue culture.	K2
<b>CO3</b>	Apply the theory knowledge gained into practical mode in order to acquire applied knowledge by day-to-day hands-on experiences.	K3
<b>CO4</b>	Analyze or interpret the results achieved in practical session in the context of existing theory and knowledge.	K4
<b>CO5</b>	Evaluate the theory and practical skills gained during the course.	K5 & K6
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create.</b>		
<b>Core X: INDUSTRY MODULE - INDUSTRIAL BOTANY</b>		
<b>CO1</b>	Understand the basics of algae in industrial applications.	K1
<b>CO2</b>	Demonstrate and to recollect the uses in fungi in industries.	K2
<b>CO3</b>	Explain bacterial role in industries.	K3
<b>CO4</b>	Compare and contrast the use of plants in industries.	K4
<b>CO5</b>	Discuss and develop skills for working in industries specializing in biomolecules.	K5 & K6
<b>ELECTIVE V - SECONDARY PLANT PRODUCTS AND FERMENTATION BIOTECHNOLOGY</b>		
<b>CO1</b>	Critically analyze the types of bioreactors and the fermentation process.	K1
<b>CO2</b>	Evaluate the role of microorganisms in industry.	K2
<b>CO3</b>	Analyze the types of bioreactors.	K3
<b>CO4</b>	Create to understand the significance of intrinsic and extrinsic factors on growth of microorganism.	K4
<b>CO5</b>	Evaluate the concept of downstream processing.	K5 & K6
<b>ELECTIVE V - ENTREPRENEURIAL OPPORTUNITIES IN BOTANY</b>		
<b>CO1</b>	Students can acquire knowledge about organic farming and their Advantages	K1
<b>CO2</b>	Analyze both the theoretical and practical knowledge in understanding various horticultural techniques.	K2
<b>CO3</b>	To develop kitchen garden or terrace garden in their living area.	K3
<b>CO4</b>	Evaluate the horticultural techniques to students can develop self employment and economical	K4

	improvement.	
<b>CO5</b>	Create and develop skills for mushroom cultivation.	K5 & K6
<b>IV Semester</b>		
<b>CORE XI : PLANT PHYSIOLOGY AND PLANT METABOLISM</b>		
<b>CO1</b>	Relate understand properties and importance of water in biological system, nutrients and its translocation.	K1
<b>CO2</b>	Demonstrate the importance of light in plant growth and the harvest of energy.	K2
<b>CO3</b>	Explain the energy requirement and nitrogen metabolism.	K3
<b>CO4</b>	Compare the various growth regulators that influence plant growth.	K4
<b>CO5</b>	Discuss the senescence and plant response to environmental stress.	K5 & K6
<b>CORE XII : BIOCHEMISTRY &amp; APPLIED BIOTECHNOLOGY</b>		
<b>CO1</b>	Knowledge on the fundamentals and significance of Plant Biochemistry	K1
<b>CO2</b>	Understanding on the structure and properties of plant biomolecules.	K2
<b>CO3</b>	Explain the role of enzymes in plants.	K3
<b>CO4</b>	Compare and contrast the methods of transgenic plants production and natural plants.	K4
<b>CO5</b>	Discuss and develop skills for effective utilization of microbial/plant enzymes and their role in biological cells.	K5 & K6
<b>ELECTIVE VI-ORGANIC FARMING</b>		
<b>CO1</b>	Knowledge on various aspects of organic farming.	K1
<b>CO2</b>	Understand the relevance of organic farming, its advantages.	K2
<b>CO3</b>	Explain the short comings against conventional high input agriculture.	K3
<b>CO4</b>	Compare the packaging methods of harvest.	K4
<b>CO5</b>	Discuss and develop skills for post harvest management.	K5 & K6
<b>ELECTIVE VI- GENE CLONING AND GENE THERAPY</b>		
<b>CO1</b>	Recollect the basic concepts of gene cloning.	K1
<b>CO2</b>	Demonstrate and to identify the selection of clones.	K2
<b>CO3</b>	Acquire knowledge on the gene therapy.	K3
<b>CO4</b>	Compare and understand the concept of gene therapy.	K4
<b>CO5</b>	Discuss and develop skills for hybrid seed production and molecular farming.	K5 & K6
<b>PROFESSIONAL COMPETENCY SKILL ENHANCEMENT</b>		

<b>CO1</b>	To learn about the structure of atoms, molecules, and chemical bonds.	K1
<b>CO2</b>	Demonstrate both the theoretical and practical knowledge in cell biology and molecular biology.	K2
<b>CO3</b>	Explain the methods of recombinant technology.	K3
<b>CO4</b>	Compare and contrast the physiological functions and metabolism.	K4
<b>CO5</b>	Discuss and develop skills for effective comprehension and communication.	K5 & K6
<b>PROJECT: GROUP PROJECT</b>		
<b>CO1</b>	For students in those pertinent core areas, the project is preparing them to become professionals after graduation.	K1
<b>CO2</b>	Compile data and familiarize yourself with techniques for planning and carrying out tests.	K2
<b>CO3</b>	Collect data and educate yourself on how to evaluate the analyzed results of your scientific studies.	K3
<b>CO4</b>	In-the-moment industrial exposure helps them become more knowledgeable and skilled in the latest technology.	K4
<b>CO5</b>	Improving communication skills and coming up with creative ideas are crucial components of training that help someone become an entrepreneur.	K5 & K6



