



Sanjivani Rural Education Society's  
**SANJIVANI ARTS, COMMERCE AND SCIENCE COLLEGE**

At: Sahajanandnagar, Post: Shingnapur, Tal: Kopargaon,  
Dist: Ahmednagar (M.S.) Pin:423603

Recognized by Govt. of Maharashtra, Affiliated to University of Pune, ID.No.PU/AN/ACS/130/2012



## Department of Botany

### Program Outcomes: B.Sc. Botany

<b>PO's. No.</b>	<b>Program Outcomes : B.Sc. Botany</b>  <b>Upon completion of this program the student will able to</b>
<b>PO1</b>	Attain thoughtful proficiency in the field of plant sciences.
<b>PO2</b>	Acquire the ability to perform in multidisciplinary domains.
<b>PO3</b>	Attain the ability to exercise intelligence of scientific knowledge for investigation and innovation and nourishment of the world
<b>PO4</b>	Learn value based ethical practices and principles committed to professional ethics.
<b>PO5</b>	Incorporate 21st century skill oriented self-directed and life-long learning.
<b>PO6</b>	Obtain ability to inculcate the knowledge of plant science in diverse contexts with global perspective.
<b>PO7</b>	Attain maturity to harness the destiny and responds to one's calling.



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## Program Specific Outcomes (PSO's) for B.Sc. Botany

PSO's. No.	<b>Program Specific Outcomes : B.Sc. Botany</b> <b>Upon completion of this programme the student will able to</b>
<b>PSO1</b>	Recall the diversity, classification, evolution and developmental changes among the plants with reference to lower and higher plant groups and create a knowledge base in understanding the basis of plant diversity, economic values and taxonomy of plants.
<b>PSO2</b>	Understand the advanced concepts of Genetics, Cell biology and Plant Biotechnology of plants and its implementation for the improvement of crop productivity.
<b>PSO3</b>	Acquire and utilize the skills of post-harvest, flower design, fruit processing and dehydration techniques, organic farming and various plant processing technologies for developing the economy to the growing world.
<b>PSO4</b>	Know about the importance of Medicinal plants and its useful parts, economically important plants in our daily life and also about the traditional medicines and herbs, and its relevance in modern times.
<b>PSO5</b>	Inculcate the methodology followed in plant breeding, pharmacognosy, herbal drug technology, plant protection, propagation and improvement.
<b>PSO6</b>	Adapt methods of scientific research in plant improvement program and create entrepreneurships, employment to the society.
<b>PSO7</b>	Analyze the impact of scientific and technological advances on the environment and society and understand the importance of biodiversity conservation, green cover development, carbon sequestration and utilize the knowledge for sustainable development.
<b>PSO8</b>	Apply the fruitful knowledge of plant sciences and plant resources for the sustainable development, betterment of society and environment by recognizing the ethical values.



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## Course Outcomes for B.Sc. Botany

Title of the Course and Course Code	F.Y.B.Sc. Semester-I BO 111: Plant Life and Utilization I
<b>On completion of the course, the students will be able to:</b>	
CO1	Recall the general outline and classification of the plant kingdom (Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms) and their economic importance. [Remembering]
CO2	Describe the life cycles of Spirogyra, lichens, and fungi with their applications in industries and agriculture. [Understanding]
CO3	Apply knowledge of algae and fungi for biofuel production, pharmaceuticals, and agriculture. [Applying]
CO4	Analyze the life cycle patterns and characteristics of bryophytes like Riccia. [Analyzing]
CO5	Evaluate the ecological significance and practical uses of bryophytes and lichens. [Evaluating]
CO6	Create solutions for utilizing algae and fungi in food and pharmaceutical industries. [Creating]
Title of the Course and Course Code	F.Y.B.Sc. Semester-I BO 112: Plant Morphology and Anatomy
<b>On completion of the course, the students will be able to:</b>	
CO1	Identify the morphological features of various reproductive parts like inflorescence, flowers, and fruits. [Remembering]
CO2	Explain the significance of reproductive morphology in plant identification and taxonomy. [Understanding]
CO3	Apply morphological knowledge in phylogeny, nomenclature, and plant breeding. [Applying]
CO4	Analyze the internal structure of plant organs like roots, stems, and leaves of dicots and monocots. [Analyzing]
CO5	Evaluate the role of different plant tissues in ecological adaptations and taxonomy. [Evaluating]
CO6	Design experiments to study anatomical features of vascular bundles and tissues for taxonomic studies. [Creating]



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<b>Title of the Course and Course Code</b>	<b>F.Y.B.Sc. Semester-I BO 113: Practicals based on BO 111 &amp; BO 112</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Recall the theoretical background of plant life cycles and anatomy. [Remembering]
CO2	Illustrate the structure and function of reproductive parts in plants. [Understanding]
CO3	Demonstrate techniques to observe and study plant morphology and anatomy. [Applying]
CO4	Analyze morphological differences in inflorescences, flowers, and fruits. [Analyzing]
CO5	Evaluate the practical significance of internal plant structures in various plant taxa. [Evaluating]
CO6	Develop practical skills to cultivate mushrooms and study plant anatomical features. [Creating]
<b>Title of the Course and Course Code</b>	<b>F.Y.B.Sc. Semester-II BO 121: Plant Life and Utilization II</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Recall the general characters and classification of vascular plants, including Pteridophytes, Gymnosperms, and Angiosperms. [Remembering]
CO2	Explain the life cycle of Nephrolepis and Cycas and their economic importance. [Understanding]
CO3	Apply the knowledge of Gymnosperms and Pteridophytes in horticulture and medicine. [Applying]
CO4	Analyze the morphological and anatomical differences between monocotyledons and dicotyledons. [Analyzing]
CO5	Evaluate the economic and ecological importance of vascular plants. [Evaluating]
CO6	Design strategies for utilizing vascular plants in agriculture and industry. [Creating]



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<b>Title of the Course and Course Code</b>	<b>F.Y.B.Sc. Semester-II BO 122: Principles of Plant Science</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Recall the fundamental concepts of plant physiology, including diffusion, osmosis, and plant growth. [Remembering]
CO2	Explain the cell structure and functions of plant cell walls and chloroplasts. [Understanding]
CO3	Apply molecular biology concepts to explain DNA structure and replication. [Applying]
CO4	Analyze the process of mitosis and meiosis in plant cells. [Analyzing]
CO5	Evaluate the significance of RNA and DNA in molecular biology. [Evaluating]
CO6	Design experiments to demonstrate diffusion, osmosis, and plasmolysis in plant cells. [Creating]
<b>Title of the Course and Course Code</b>	<b>F.Y.B.Sc. Semester-II BO 123: Practicals based on BO 121 &amp; BO 122</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Identify the morphological and anatomical features of Pteridophytes, Gymnosperms, and Angiosperms. [Remembering]
CO2	Illustrate the process of mitosis and meiosis using appropriate specimens. [Understanding]
CO3	Demonstrate the preparation of slides to observe nuclear material and chlorophyll content. [Applying]
CO4	Analyze the differences in cell structures between prokaryotic and eukaryotic cells. [Analyzing]
CO5	Evaluate the significance of plant physiology experiments like osmosis and plasmolysis. [Evaluating]
CO6	Create detailed reports and observations based on laboratory experiments. [Creating]



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## F. Y. B. Sc. Botany [Semester - I]

Title of the Course and Course Code	Title: Applied Aspects of Plant Sciences Course Code – BOT-101-T Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will be able to apply advanced plant biotechnology techniques, such as genetic engineering and tissue culture, to improve crop productivity, develop genetically modified crops, and produce plant-derived pharmaceuticals.
CO2	Students will demonstrate the ability to implement and evaluate sustainable agricultural practices, including organic farming, integrated pest management, and the use of biofertilizers, to enhance soil health and crop yields while minimizing environmental impact.
CO3	Students will be proficient in utilizing precision agriculture technologies, such as remote sensing, GIS, drones, and sensors, to monitor and manage crop health, optimize resource use, and improve overall farm management efficiency.
CO4	Students will understand the role of plant-associated microbes in enhancing plant health and productivity, and be able to apply knowledge of beneficial microbes (e.g., Rhizobium, mycorrhizal fungi, PGPR) to improve soil fertility and plant growth in agricultural settings.

Title of the Course and Course Code	Title: Practical Based on BOT-101-T Course Code – BOT-102-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will develop hands-on expertise in using essential laboratory instruments and equipment.
CO2	Students will gain practical knowledge in demonstrating and evaluating genetically modified crops and evaluate the agronomic performance, environmental impact, and socio-economic benefits of these genetically modified crops
CO3	Students will acquire the ability to estimate soil organic carbon using methods like Walkley-Black or similar wet oxidation techniques and interpret the significance of these measurements in soil health and sustainable agriculture.
CO4	Students will demonstrate the ability to compost kitchen waste and convert it into biofertilizer, highlighting the principles of organic waste management and sustainable recycling.
CO5	Students will study the effect of Mycorrhiza on crop plant growth attributes and understand the role of various plant-associated microbes, such as Rhizobia, Mycorrhizal fungi, PGPR, endophytic fungi, and nitrogen-fixing cyanobacteria, in improving plant health and productivity.
CO6	Students will demonstrate post-harvest techniques, including the preparation, value addition and preservation of agricultural products.



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Title of the Course and Course Code	Title: Agro-Tourism Course Code – OE-101-BOT-T Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Develop a comprehensive understanding of the concepts, principles, and practices of agro-tourism, including its history, development, and global trends.
CO2	Gain knowledge of sustainable agricultural practices and their importance in the context of agro-tourism, including organic farming, biodiversity conservation, and soil health management.
CO3	Acquire skills in planning, developing, and managing agro-tourism businesses, including business planning, marketing strategies, and customer relationship management.
CO4	Understand the importance of cultural and community engagement in agro-tourism, including the preservation of local traditions, heritage, and culinary practices.
CO5	Appreciate the role of agro-tourism in promoting environmental conservation, sustainable tourism practices, and responsible travel behavior.

Title of the Course and Course Code	Title: Plants and Human Welfare Course Code – OE-102-BOT-T Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Develop a comprehensive understanding of the diversity of plant species and their utility in various aspects of human life, including food, medicine, shelter, and clothing.
CO2	Gain knowledge about medicinal plants, their active compounds, and their therapeutic uses in traditional and modern medicine.
CO3	Acquire awareness of sustainable practices in plant resource management, including conservation, cultivation, and utilization, to ensure long-term benefits for both humans and the environment.
CO4	Appreciate the significance of traditional knowledge systems related to plants and their role in preserving cultural heritage and biodiversity.
CO5	Develop critical thinking and problem-solving skills to evaluate the ethical, social, and environmental implications of plant use and propose sustainable solutions

Title of the Course and Course Code	Course Title: Agriculture for Competitive Exam Course Code – OE-103-BOT-T
<b>On completion of the course, the students will be able to:</b>	
CO1	Develop a comprehensive understanding of key agricultural concepts, theories, and practices relevant to competitive exams.
CO2	Develop the ability to analyse and solve complex agricultural problems using critical thinking and problem-solving skills.
CO3	Improve time management skills to effectively answer exam questions within the allotted time frame.
CO4	Develop effective test-taking strategies to improve performance in competitive exams
CO5	Build confidence in tackling questions related to agriculture, agronomy, horticulture, and other related fields in competitive exams.



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Title of the Course and Course Code	Course Title: Flower Design Techniques Course Code – SEC-101-BOT-P
<b>On completion of the course, the students will be able to:</b>	
CO1	Develop proficiency in creating various basic floral arrangements, including handtied bouquets, vase arrangements, and table centrepieces, using proper techniques and principles of design.
CO2	Acquire advanced skills in creating complex floral designs, such as cascading bouquets, floral arches, and large-scale installations, demonstrating creativity and attention to detail.
CO3	Gain knowledge of different floral design styles, such as traditional, contemporary, and seasonal, and stay updated with current trends in the floral industry.
CO4	Understand the principles of flower selection, care, and handling, including proper conditioning, storage, and use of floral foam and other design tools.
CO5	Develop the ability to create customized floral designs tailored to specific occasions, themes, and client preferences, demonstrating creativity and versatility in design.

Title of the Course and Course Code	Title: Post-Harvest Technology Course Code – SEC-102-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Develop proficiency in post-harvest handling techniques, including sorting, grading, and packaging, to maintain product quality and minimize losses.
CO2	Acquire knowledge of various post-harvest treatments, such as washing, waxing, and irradiation, and their effects on shelf life and quality of harvested products.
CO3	Understand the importance of quality control measures in post-harvest management and learn how to implement them effectively to ensure product quality and safety.
CO4	Gain the ability to implement proper storage techniques, such as cold storage and controlled atmosphere storage, to prolong the shelf life of perishable products.
CO5	Develop skills in developing value-added products from harvested crops, such as processing fruits into juices or snacks, to add value and increase marketability





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Title of the Course and Course Code	Title: Algal Technology Course Code – SEC-103-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Develop proficiency in cultivating algae using various methods, including open pond systems and photobioreactors, to maximize biomass production
CO2	Acquire expertise in harvesting algae biomass and processing it into valuable products, such as biofuels, biofertilizers, and high-value chemicals.
CO3	Gain knowledge of algal biotechnology techniques, such as genetic engineering and strain selection, to enhance algal productivity and product quality.
CO4	Develop skills in using algae for bioremediation purposes, including the removal of pollutants from wastewater and the sequestration of carbon dioxide from the atmosphere.
CO5	Develop the ability to develop innovative algal-based products, such as cosmetics, pharmaceuticals, and functional foods, to meet market demands and promote sustainable development.

Title of the Course and Course Code	Course Title: Basics of Plant Sciences Course Code - BOT-151-T
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will demonstrate a clear understanding of the definition and concept of plant diversity, including the general outline of the plant kingdom and its major groups.
CO2	Students will be able to identify and describe the characteristics of algae, and explain their economic and biotechnological importance, including their roles in food, industry, and future research prospects.
CO3	Students will understand the ecological roles of fungi in nutrient cycling and symbiotic relationships, and recognize their economic importance in industry, agriculture, and food production.
CO4	Students will identify different types of lichens and bryophytes, and describe their ecological significance and economic uses, including their roles in environmental monitoring and traditional medicine
CO5	Students will demonstrate knowledge of the characteristics and importance of pteridophytes, gymnosperms, and angiosperms, including their ecological roles, economic significance, and contributions to ecosystems and human welfare.



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Title of the Course and Course Code	Title: Practical Based on BOT 151-BOT-T Course Code - 152-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will be able to identify and classify a wide range of plant species from different habitats, understanding their ecological roles and evolutionary relationships
CO2	Students will be able to analyze and interpret the external and internal morphology of vegetative organs in various plant groups, enhancing their knowledge of plant anatomy and physiology
CO3	Students will gain practical skills in examining and describing the types and modifications of roots, stems, and leaves, understanding their structural adaptations and ecological functions.
CO4	Students will acquire the ability to investigate and describe the reproductive structures and life cycles of different plant groups, including algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms.
CO5	Students will understand the morphology and function of inflorescences, flowers, fruits, and seeds, and will be able to identify key characteristics used in plant identification and classification.
CO6	Students will gain hands-on experience in botanical fieldwork, including conducting botanical excursions, documenting vegetation, and studying plant diversity in natural habitats

Title of the Course and Course Code	Title: Fruit Processing and Flower Arrangement Course Code – OE-151-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will demonstrate the ability to perform various fruit processing techniques, such as canning, drying, freezing, and making jams, jellies, and preserves, ensuring the preservation of nutritional value, flavor, and texture of fruits.
CO2	Students will understand the chemical and biological processes involved in fruit spoilage and the methods used to prevent it. They will be able to apply different preservatives, packaging techniques, and storage conditions to enhance the shelf life and safety of processed fruits.
CO3	Students will be skilled in designing and creating various types of flower arrangements. They will apply principles of floral design and the use of different floral materials and tools.
CO4	Students will be able to express their creativity through innovative and aesthetically pleasing flower arrangements.
CO5	Students will bridge the gap between theoretical knowledge and practical applications by gaining exposure to the fruit processing industry and the floral design market.



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Title of the Course and Course Code	Title: Mushroom technology Course Code – OE-152-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will demonstrate a thorough understanding of the biology, taxonomy, and ecological roles of different mushroom species, recognizing their nutritional and economic importance
CO2	Students will acquire practical skills in various mushroom cultivation techniques, including substrate preparation, inoculation, spawn production, and environmental control, successfully cultivating different species.
CO3	Students will be able to set up and manage a mushroom farm, implementing effective hygiene and sanitation practices, pest and disease management strategies, and crop rotation to ensure high yield and quality.
CO4	Students will master post-harvest handling techniques, including cleaning, packaging, storage, and transportation, to maintain mushroom quality and extend shelf life. They will also be skilled in value-added processing, such as drying and canning.
CO5	Students will understand the economic aspects of mushroom production, including cost analysis and market trends.
CO6	Students will successfully apply their theoretical knowledge to practical scenarios, demonstrating the ability to solve problems and optimize mushroom production processes.
CO7	Students will develop entrepreneurial skills, including business planning and management, enabling them to start and manage their own mushroom cultivation enterprises

Title of the Course and Course Code	Title: Vertical and Terrace Gardening Course Code – OE-153-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will be proficient in various methods of establishing vertical gardens for the selection to select appropriate structures based on environmental and spatial considerations.
CO2	Graduates will be adept at incorporating sustainable gardening practices, such as using recyclable materials and preparing kitchen waste manure, thereby promoting environmental stewardship and waste reduction in gardening.
CO3	Students will acquire hands-on experience in setting up and maintaining soil-less gardening systems such as hydroponics and aquaponics.
CO4	Participants will gain knowledge about permaculture principles and edible landscaping, equipping them with the skills to design and implement sustainable, productive green spaces that provide food resources and ecological benefits.
CO5	Students will learn efficient irrigation and fertilization techniques specific to vertical gardens, ensuring optimal plant growth and resource conservation.
CO6	Students will be prepared to engage with communities and share knowledge about vertical gardening techniques and benefits, fostering broader adoption of these practices and contributing to community well-being and urban beautification.



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Title of the Course and Course Code	Title: Plant Preservation Techniques Course Code – SEC-151-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will be proficient in the use of various tools and equipment for plant preservation, understanding their specific uses and maintenance requirements
CO2	Students will demonstrate mastery in several specimen drying techniques and will be able to choose and apply the best method based on the nature of the plant material and the intended use of the specimens.
CO3	Students will gain skills in preparing and processing pressed specimens for herbarium storage, ensuring the longevity and utility of collected specimens for scientific research
CO4	Students will acquire hands-on experience in preserving plant specimens using wet preservation methods, ensuring the preservation of cellular structures and morphological details necessary for further scientific study.
CO5	Students will learn and demonstrate modern methods used in the preservation of botanical specimens, particularly in creating dry floral arrangements.
CO6	Through visits to museums, herbariums, and plant preservation units, students will integrate classroom learning with professional practices, understanding the operational standards and challenges in botanical preservation environments.

Title of the Course and Course Code	Course Title: Millets for Sustainable Agriculture Development Course Code – SEC-152-BOT-P
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will acquire a comprehensive understanding of different types of millets.
CO2	Participants will gain detailed knowledge about the by-products of millets, and understand the processing techniques.
CO3	Through demonstrations and visits to processing units, students will develop hands on skills.
CO4	The practical will enhance students' knowledge about the cultivation, processing, and uses of millets.
CO5	Students will be familiar with integrated pest management (IPM) techniques for sustainable millet cultivation.



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Title of the Course and Course Code	Title: Plant Propagation Techniques Course Code – SEC-153-BOT-P Course
<b>On completion of the course, the students will be able to:</b>	
CO1	Students will gain hands-on experience and proficiency in the use and maintenance of various tools and equipment used in plant propagation, enabling effective and efficient handling of nursery operations.
CO2	Students will be able to operate and manage different types of controlled environments for plant propagation.
CO3	Students will develop skills in identifying, categorizing, and cultivating different types of ornamental plants for enhancing their ability to design and maintain aesthetic garden spaces.
CO4	Students will acquire the ability to prepare nursery beds, select appropriate planting materials and containers, and effectively raise seedlings, applying their knowledge to the establishment and management of a successful nursery.
CO5	Students will master both natural and artificial vegetative propagation methods with diverse methods to propagate various plant species.
CO6	Students will demonstrate knowledge and practical skills in different types of irrigation systems, fertilizer applications, and weed control strategies, contributing to sustainable nursery and garden management.
CO7	Students will learn and apply advanced horticultural practices using modern tools and techniques, showcasing their capability in specialized gardening methods.



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### S.Y.B.Sc. Semester III

**Title of the  
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**BO-231 TAXONOMY OF ANGIOSPERMS & PLANT ECOLOGY(23141)**

**On completion of the course, the students will be able to:**

CO1	<b>Understand</b> the principles of plant taxonomy and its role in the classification and identification of angiosperms (flowering plants) (Understanding).
CO2	<b>Identify</b> major taxonomic groups of angiosperms and their distinguishing characteristics using taxonomic keys and other identification tools (Applying).
CO3	<b>Analyze</b> the evolutionary relationships among angiosperms and evaluate their significance in understanding plant diversity and evolution
CO4	<b>Evaluate</b> the ecological roles of angiosperms in ecosystems and their interactions with other organisms
CO5	<b>Assess</b> the impact of human activities on plant communities and ecosystems, emphasizing the need for conservation and restoration
CO6	<b>Design</b> and conduct field surveys to collect and analyze data on plant taxonomy and ecology, and communicate findings through scientific reports

**Title of the  
Course and  
Course Code**

**BO-232 PLANT PHYSIOLOGY(23142)**

**On completion of the course, the students will be able to:**

CO1	<b>Understand</b> the fundamental concepts of plant physiology, including plant cells, tissues, and organs
CO2	<b>Explain</b> the key physiological processes in plants such as photosynthesis, respiration, transpiration, and nutrient uptake
CO3	<b>Analyze</b> the role of plant hormones in regulating growth, development, and responses to environmental stimuli
CO4	<b>Evaluate</b> the mechanisms of water and mineral transport in plants and their importance in plant growth and adaptation
CO5	<b>Design</b> experiments to study plant physiological processes and interpret experimental data related to plant functions
CO6	<b>Assess</b> the significance of plant physiology in agriculture, particularly in improving crop yield and addressing food security challenges



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### S.Y.B.Sc. Semester III

Title of the Course and Course Code	BO-233-Practical based on BO 231 & BO 232
<b>On completion of the course, the students will be able to:</b>	
CO1	<b>Develop</b> practical skills in plant collection, preservation, and identification of angiosperms using taxonomic keys and field guides
CO2	<b>Analyze</b> the morphological characteristics and diagnostic features of plants for accurate classification
CO3	<b>Conduct</b> ecological surveys to assess plant distribution, population density, and community structure
CO4	<b>Interpret</b> ecological data related to plant distribution and relationships with other organisms in natural habitats
CO5	<b>Document</b> fieldwork observations systematically and accurately during ecological and taxonomic studies
CO6	<b>Prepare</b> scientific reports that summarize the findings of plant ecology investigations and effectively communicate the results

### S.Y.B.Sc. Semester IV

Title of the Course and Course Code	BO-241 PLANT ANATOMY & EMBRYOLOGY (24141)
<b>On completion of the course, the students will be able to:</b>	
CO1	<b>Understand</b> the basic principles of plant anatomy and the structural organization of different plant tissues and cells
CO2	<b>Explain</b> the anatomical features of various plant organs (roots, stems, leaves, flowers, and fruits) and their functions
CO3	<b>Analyze</b> the adaptations of plant tissues and cells to different environmental conditions
CO4	<b>Evaluate</b> the factors influencing seed germination and the anatomical aspects of seed and embryo development
CO5	<b>Develop</b> practical skills in the microscopic study of plant tissues, embryos, and seeds
CO6	<b>Interpret</b> anatomical and embryological data related to plant species and communicate findings through scientific reports



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### S.Y.B.Sc. Semester IV

**Title of the  
Course and  
Course Code**

**BO-242 PLANT BIOTECHNOLOGY(24142)**

**On completion of the course, the students will be able to:**

- |     |   |
|-----|---|
| CO1 | <b>Understand</b> the fundamental principles of biotechnology and its applications in plant science   |
| CO2 | <b>Explain</b> the techniques and tools used in plant biotechnology, including genetic engineering, tissue culture, and molecular markers                                       |
| CO3 | <b>Evaluate</b> the role of genetic engineering in modifying plant traits for improved yield, pest resistance, and nutritional content  |
| CO4 | <b>Analyze</b> the methodologies of plant tissue culture and its applications in micropropagation and plant regeneration  |
| CO5 | <b>Develop</b> practical skills in plant tissue culture techniques, genetic engineering, and molecular biology methods  |
| CO6 | <b>Assess</b> the ethical, environmental, and regulatory considerations of genetically modified organisms (GMOs) in agriculture, and analyze their potential benefits and risks |

**Title of the  
Course and  
Course Code**

**BO-242 PLANT BIOTECHNOLOGY(24142)**

**On completion of the course, the students will be able to:**

- |     |   |
|-----|---|
| CO1 | <b>Develop</b> practical skills in plant tissue preparation, sectioning, and staining for microscopic observation   |
| CO2 | <b>Identify</b> and differentiate various plant tissues (epidermis, xylem, phloem, and meristems) through hands-on experience with microscopy                 |
| CO3 | <b>Analyze</b> the internal structures of plant organs (roots, stems, leaves, and flowers) and understand their functional significance                       |
| CO4 | <b>Understand</b> the principles of embryology by studying the development of plant embryos at different stage  |
| CO5 | <b>Gain</b> practical experience in plant tissue culture techniques, including micropropagation and callus induction, while aseptically handling plant tissue |
| CO6 | <b>Evaluate</b> the principles of plant genetic transformation and demonstrate techniques for introducing foreign genes into plant cells                      |





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### T.Y.B.Sc. Semester V

Title of the Course and Course Code	BO-351 ALGAE & FUNGI (35141)
<b>On completion of the course, the students will be able to:</b>	
CO1	<b>Understand</b> the taxonomy and classification of algae and fungi, including their evolutionary relationships and diversity
CO2	<b>Analyze</b> the morphology, anatomy, and reproductive structures of different algal and fungal groups
CO3	<b>Evaluate</b> the ecological roles of algae and fungi in various ecosystems, including their contributions to nutrient cycling and symbiotic associations
CO4	<b>Explore</b> the economic importance of algae and fungi in agriculture, food industry, biotechnology, and medicine
CO5	<b>Develop</b> practical skills in the identification and characterization of algae and fungi through microscopy and laboratory techniques
CO6	<b>Communicate</b> findings related to the study of algae and fungi through scientific reports and presentations, demonstrating data analysis and interpretation skills

### T.Y.B.Sc. Semester V

Title of the Course and Course Code	BO-352 ARCHEGONIATE(35142)
<b>On completion of the course, the students will be able to:</b>	
CO1	<b>Understand</b> the diversity and classification of archegoniates, including bryophytes (mosses, liverworts, hornworts) and pteridophytes
CO2	<b>Analyze</b> the life cycles and reproductive structures of different groups of archegoniates, focusing on their unique adaptations
CO3	<b>Evaluate</b> the ecological significance of bryophytes and pteridophytes, including their contributions to soil formation, carbon cycling, and habitat creation
CO4	<b>Explore</b> the economic importance of archegoniates in horticulture, medicine, and biodiversity conservation
CO5	<b>Develop</b> practical skills in the identification and study of archegoniate plants through microscopy and fieldwork
CO6	<b>Communicate</b> findings related to archegoniates effectively through scientific reports and presentations, demonstrating data analysis and interpretation skills



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### **T.Y.B.Sc. Semester V**

**Title of the  
Course and  
Course Code**

**BO 357 -Practical based on BO 351 & BO352**

**On completion of the course, the students will be able to:**

CO1	Identify and classify various species of algae, fungi, mosses, and liverworts based on their morphological features and reproductive structures.
CO2	Analyze the life cycles of selected algae, fungi, and archegoniates, focusing on their reproductive adaptations and alternation of generations.
CO3	Conduct microscopic examination of cells, tissues, and reproductive structures of algae, fungi, and archegoniates to understand their anatomy and function.
CO4	Investigate the adaptive strategies of algae, fungi, and archegoniates in response to different environmental conditions, particularly their ability to thrive in various habitats.
CO5	Observe and document the growth patterns of algae and fungi under controlled conditions, analyzing their ecological roles and contributions to nutrient cycling.
CO6	Explore the ecological and industrial significance of algae, fungi, and archegoniates, including their roles in ecosystems, biotechnology, and environmental conservation.

### **T.Y.B.Sc. Semester V**

**Title of the  
Course and  
Course Code**

**BO-353 SPERMATOPHYTA & PALEOBOTANY (35143)**

**On completion of the course, the students will be able to:**

CO1	Understand the classification, diversity, and evolutionary significance of spermatophytes (seed-producing plants), including gymnosperms and angiosperms.
CO2	Analyze the reproductive structures, life cycles, and ecological adaptations of spermatophytes in different habitats and ecosystems.
CO3	Explore the economic importance of spermatophytes, particularly their contributions to agriculture, forestry, and medicinal applications.
CO4	Develop knowledge of paleobotany, including the techniques used to study fossilized plants and the significance of plant evolution through geological time.
CO5	Interpret fossil evidence to reconstruct past climates, geological events, and paleoecological environments, understanding their relevance to Earth's history.
CO6	Acquire practical skills in identifying and analyzing fossil plant specimens, and communicate findings through scientific reports and presentations.



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<b>Title of the Course and Course Code</b>	<b>BO-354 PLANT ECOLOGY(35144)</b>
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**On completion of the course, the students will be able to:**

CO1	Understand the relationship between plants and their environment, including the influence of abiotic and biotic factors on plant communities.
CO2	Analyze the distribution and abundance of plant species across various habitats and ecosystems, considering ecological interactions such as competition, predation, and mutualism.
CO3	Explore ecological succession and the temporal dynamics of plant communities, understanding the changes in species composition and structure over time.
CO4	Gain insights into ecosystem ecology, focusing on the flow of energy and nutrients within ecological systems and the importance of biodiversity in ecosystem functioning.
CO5	Learn the principles of conservation ecology, emphasizing the preservation of biodiversity and natural habitats, and the role of plant ecology in ecological restoration and land management.
CO6	Develop practical skills in conducting field surveys, collecting and analyzing ecological data, and effectively communicating findings through scientific reports and presentations.

<b>Title of the Course and Course Code</b>	<b>BO 358 -Practical based on BO 353 &amp; BO 354</b>
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**On completion of the course, the students will be able to:**

CO1	Identify and classify various seed plant species and fossilized plant specimens based on morphological features, reproductive structures, and fossil evidence.
CO2	Analyze the life cycles, reproductive structures, and seed development of selected seed plant species, as well as the anatomical features of roots, stems, and leaves.
CO3	Examine seeds under a microscope, understanding their structures, adaptations for dispersal, and factors influencing germination success.
CO4	Conduct field studies to assess plant biodiversity, population densities, and ecological adaptations to various niches, such as xerophytes and hydrophytes
CO5	Investigate plant interactions with other organisms, including pollinators, herbivores, and mycorrhizal fungi, and evaluate human impacts on plant communities and ecosystems.
CO6	Apply paleobotanical techniques to analyze fossil evidence, reconstruct ancient plant communities, and interpret past climates and ecosystems.



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### T.Y.B.Sc. Semester V

**Title of the  
Course and  
Course Code**

**BO-355 CELL & MOLECULAR BIOLOGY (35145)**

**On completion of the course, the students will be able to:**

CO1	Understand the fundamental principles of cell biology, including the structure, function, and organization of cells and their organelles.
CO2	Analyze the molecular components and processes within the cell, such as DNA replication, transcription, translation, and cell cycle regulation.
CO3	Explore the principles of genetics, including Mendelian inheritance, gene expression, and the molecular basis of genetic mutations and disorders.
CO4	Gain practical knowledge of molecular biology techniques, including PCR, DNA sequencing, and gene cloning, and their applications in biotechnology and genetic engineering.
CO5	Investigate the role of molecular biology in studying plant genetics and plant molecular biology, with applications in research and biotechnology.
CO6	Develop practical skills in conducting molecular biology experiments, analyzing DNA and protein sequences, and effectively communicating findings through scientific reports and presentations.

### T.Y.B.Sc. Semester V

**Title of the  
Course and  
Course Code**

**BO-356 GENETICS (35146)**

**On completion of the course, the students will be able to:**

CO1	Understand the fundamental principles of genetics, including inheritance patterns, gene structure, and genetic variation in individuals and populations.
CO2	Analyze Mendelian genetics and the laws governing the transmission of traits, exploring the roles of chromosomes, genes, and alleles in genetic makeup.
CO3	Investigate the molecular basis of gene expression, including transcription, translation, and gene regulation, and how these processes influence cellular functions.
CO4	Explore population genetics and the factors influencing genetic variation within populations, including mutation, selection, and genetic drift.
CO5	Gain practical knowledge of genetic techniques such as genetic mapping, DNA sequencing, and their applications in biotechnology and genetic engineering.
CO6	Develop practical skills in conducting genetic experiments, analyzing data, and effectively communicating findings through scientific reports and presentations.



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<b>Title of the Course and Course Code</b>	<b>Practical based on BO 355 &amp; BO 356</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Microscopic examination of plant cells and organelles to understand their structures, functions, and the processes of mitosis, meiosis, and cell division.
CO2	Conduct and analyze cross-breeding experiments to study Mendelian genetics, inheritance patterns, and genetic phenomena like linkage and recombination.
CO3	Apply molecular techniques in plant research, such as DNA extraction, gel electrophoresis, and PCR, to investigate genetic variation and gene expression.
CO4	Explore plant responses to environmental stimuli, including hormone treatments or light exposure, and understand the principles of cell signaling and gene regulation.
CO5	Investigate plant breeding techniques, such as hybridization and selection, and analyze genetic data using molecular markers and genetic mapping techniques.
CO6	Explore genetic engineering concepts and techniques used in plant biotechnology, applying knowledge in practical experiments and research.

**T.Y.B.Sc. Semester V**

<b>Title of the Course and Course Code</b>	<b>BO-3510 MEDICINAL BOTONY(351410)</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand the principles of medicinal botany and the roles of plants in traditional and modern medical practices.
CO2	Explore the medicinal properties and active compounds of various plant species, including their pharmacological actions and therapeutic uses.
CO3	Gain knowledge of traditional medicinal systems, plant identification, and preparation methods for medicinal use across different cultures and regions.
CO4	Understand the principles of pharmacognosy and learn the techniques for analyzing plant-derived drugs and natural products.
CO5	Investigate the safety, efficacy, and potential side effects of herbal remedies, along with ethical and regulatory considerations.
CO6	Develop practical skills in identifying medicinal plants and analyzing their active compounds, with applications in drug discovery and natural product-based pharmaceuticals



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### T.Y.B.Sc. Semester V

<b>Title of the Course and Course Code</b>		<b>BO-3511 PLANT DIVERSITY &amp; HUMAN HEALTH</b>
<b>On completion of the course, the students will be able to:</b>		
CO1	Understand the significance of plant diversity in maintaining human health, well-being, and providing essential ecosystem services such as air purification and water filtration.	
CO2	Gain knowledge of the medicinal properties of various plant species and their role in traditional, alternative medicine, and drug discovery.	
CO3	Explore the nutritional value of plant-based foods and the role of plant-based diets in preventing chronic diseases and promoting overall health.	
CO4	Learn about the therapeutic uses, benefits, and limitations of herbal remedies, along with the sustainable use of medicinal plants.	
CO5	Investigate the impact of climate change, habitat loss, and plant conservation on human health, understanding the need for sustainable management of plant resources	
CO6	Develop practical skills in identifying and utilizing medicinal plants and plant-based foods for enhancing human health, and communicate findings effectively through scientific reports and presentations.	

### T.Y.B.Sc. Semester VI

<b>Title of the Course and Course Code</b>		<b>BO-3511 PLANT DIVERSITY &amp; HUMAN HEALTH</b>
<b>On completion of the course, the students will be able to:</b>		
CO1	Understand the fundamental principles of plant physiology, including the structure and function of plant cells, tissues, and organs.	
CO2	Gain knowledge of key physiological processes in plants, such as photosynthesis, respiration, transpiration, and nutrient uptake, and their roles in plant health.	
CO3	Explore the function of plant hormones in regulating growth, development, and responses to environmental stimuli and stress factors	
CO4	Investigate the mechanisms of water and mineral transport in plants and their significance for growth, adaptation, and overall physiological function.	
CO5	Develop practical skills in conducting physiological experiments, data collection, and analysis related to plant responses to abiotic and biotic stresses.	
CO6	Understand the relationship between plant physiology and agriculture, focusing on crop yield improvement, stress tolerance enhancement, and the role of physiology in environmental interactions.	



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### T.Y.B.Sc. Semester VI

<b>T.Y.B.Sc. Semester VI</b>	
<b>Title of the Course and Course Code</b>	<b>BO-362 BIOCHEMISTRY (36142)</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand the basic principles of biochemistry, including the structure and function of key biomolecules such as proteins, enzymes, carbohydrates, lipids, and nucleic acids.
CO2	Gain knowledge of biochemical pathways and processes, including metabolism and energy production, and their relevance to living organisms.
CO3	Explore the principles of enzymology and enzyme kinetics, including the role of enzymes in biochemical reactions and cellular processes.
CO4	Understand the role of biochemistry in cellular communication and signal transduction, and how these processes regulate gene expression and cellular responses.
CO5	Develop practical skills in conducting biochemical experiments, utilizing techniques for biochemical analysis, data collection, and interpretation
CO6	Analyze and interpret biochemical data effectively and communicate findings through scientific reports and presentations, recognizing the significance of biochemistry in fields such as medicine, biotechnology, and nutrition.

### T.Y.B.Sc. Semester VI

<b>T.Y.B.Sc. Semester VI</b>	
<b>Title of the Course and Course Code</b>	<b>BO-363 PLANT PATHOLOGY (36143)</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand the basic principles of plant pathology, including the study of plant diseases, their causes, and their impact on agriculture and ecosystems
CO2	Gain knowledge of various types of plant pathogens, including fungi, bacteria, viruses, and nematodes, and their effects on plant health.
CO3	Learn to identify symptoms and signs of plant diseases and apply methods for disease diagnosis and identification.
CO4	Explore the mechanisms of plant-pathogen interactions, focusing on host resistance, pathogen virulence factors, and epidemiological factors influencing disease spread.
CO5	Understand principles and strategies for disease management and control, including cultural, chemical, biological, and integrated approaches to enhance crop protection.
CO6	Develop practical skills in disease diagnosis, pathogen isolation, and control methods while analyzing data from plant pathology experiments and effectively communicating findings through scientific reports and presentations.



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<b>Title of the Course and Course Code</b>	<b>BO-364 EVOLUTION &amp; POPULATION GENETICS (36144)</b>
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**On completion of the course, the students will be able to:**

CO1	Understand the principles of evolution and the mechanisms driving biological change over time, including natural selection, genetic drift, gene flow, and mutation.
CO2	Gain knowledge of the evidence for evolution, such as fossil records, comparative anatomy, and molecular biology, and their roles in supporting evolutionary theory.
CO3	Learn about the modes of speciation and the factors contributing to the formation of new species, as well as the forces influencing allele frequencies and genetic diversity in populations.
CO4	Explore the principles of population genetics, including genetic variation within populations and the concept of adaptation, highlighting the role of genetic variation in fitness and survival.
CO5	Develop practical skills in analyzing genetic data, conducting population genetics experiments, and using genetic markers to study evolutionary relationships.
CO6	Analyze and interpret data related to evolution and population genetics and effectively communicate findings through scientific reports and presentations, fostering an appreciation for the significance of these fields in understanding the diversity of life.

**T.Y.B.Sc. Semester VI**

<b>Title of the Course and Course Code</b>	<b>BO-365 ADVANCED PLANT BIOTECHNOLOGY (36145)</b>
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**On completion of the course, the students will be able to:**

CO1	Understand advanced concepts and principles in plant biotechnology,
CO2	Gain knowledge of the applications of biotechnology in crop improvement, focusing on the development of genetically modified (GM) crops
CO3	Explore the principles and applications of molecular markers in plant breeding and genetic analysis
CO4	Learn about the applications of plant biotechnology in producing biofuels, pharmaceuticals, and industrial products, and how these contribute to sustainability and innovation.
CO5	Develop practical skills in genetic engineering, molecular analysis, and bioinformatics techniques.
CO6	Analyze ethical, social, and environmental considerations related to the use of genetically modified organisms (GMOs)





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### T.Y.B.Sc. Semester VI

Title of the Course and Course Code	<b>BO-366 PLANT BREEDING &amp; SEED TECHNOLOGY (36146)</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand the principles and methods of plant breeding, including the development of new plant varieties with desirable traits and the genetic basis of these traits.
CO2	Gain knowledge of various breeding techniques, such as hybridization, selection, and mutation breeding, and their applications in enhancing crop performance.
CO3	Explore the importance of germplasm conservation and utilization in plant breeding programs, as well as the role of biotechnology and molecular markers in modern breeding practices.
CO4	Learn about the principles and techniques of seed production, processing, storage, and the importance of seed quality and certification in agriculture.
CO5	Develop practical skills in conducting plant breeding experiments, seed production, and seed quality assessment while analyzing and interpreting related data.
CO6	Understand the significance of plant breeding and seed technology

### T.Y.B.Sc. Semester VI

Title of the Course and Course Code	<b>BO-3610 NURSERY &amp; GARDENING MANAGEMENT (361410)</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand the principles and practices of nursery management, including plant propagation techniques, nursery design
CO2	Gain knowledge of the selection and cultivation of plant
CO3	Explore the importance of pest and disease management in maintaining healthy nursery stock and gardens
CO4	Learn about landscape design techniques, including the selection and arrangement of plants for aesthetic and functional purposes,.
CO5	Develop practical skills in plant propagation, nursery operation, garden maintenance, and the use of modern technology and tools in nursery and garden management.
CO6	Analyze and interpret data related to nursery and garden management and effectively communicate findings through reports and presentations



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### T.Y.B.Sc. Semester VI

<b>T.Y.B.Sc. Semester VI</b>	
<b>Title of the Course and Course Code</b>	<b>BO-3611 BIOFERTILIZERS (361411)</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand the concept and significance of biofertilizers
CO2	Gain knowledge of the different types of biofertilizers,
CO3	Explore the principles of microbial inoculants and their application in crop production and soil improvement.
CO4	Understand the process of biofertilizer production, quality control, and application methods
CO5	Learn about the integration of biofertilizers with other sustainable agriculture practices
CO6	Analyze and interpret data related to biofertilizer experiments and effectively communicate findings through scientific reports and presentations

### T.Y.B.Sc. Semester VI

<b>T.Y.B.Sc. Semester VI</b>	
<b>Title of the Course and Course Code</b>	<b>BO 367 -Practical based on BO 361 &amp; BO 362</b>
<b>On completion of the course, the students will be able to:</b>	
CO1	Understand and investigate key physiological processes in plants
CO2	Measure physiological parameters such as chlorophyll content, stomatal conductance, and water potential
CO3	Explore plant responses to various environmental conditions, including light, temperature, and humidity
CO4	Gain practical experience in isolating and analyzing plant biomolecules, including proteins, carbohydrates, lipids, and nucleic acids, to understand their roles in plant physiology.
CO5	Conduct enzyme assays and kinetics studies to evaluate enzymatic activities in plant tissues and quantify important biochemical components like chlorophyll, sugars, and amino acids.
CO6	Investigate metabolic pathways such as glycolysis, Krebs cycle, and the Calvin cycle, and explore the role of secondary metabolites in plant defense and adaptation to stress.



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### T.Y.B.Sc. Semester VI

Title of the Course and Course Code	BO 368 - Practical based on BO 363 & BO 364
<b>On completion of the course, the students will be able to:</b>	
CO1	Identify and diagnose plant diseases caused by various pathogens, including fungi, bacteria, viruses, and nematodes, through observational and laboratory techniques.
CO2	Study and interpret disease symptoms and signs on plant tissues and organs to enhance understanding of pathogen-host interactions.
CO3	Utilize laboratory techniques to isolate and culture plant pathogens, applying knowledge of disease epidemiology and management strategies.
CO4	Analyze genetic variation within plant populations using molecular markers such as DNA sequencing and PCR to understand evolutionary processes.
CO5	Gain hands-on experience in calculating genetic diversity indices and conducting Hardy-Weinberg equilibrium tests to assess population genetics.
CO6	Explore the role of population genetics in conservation biology and understand plant population dynamics, integrating knowledge of disease impact on plant health.

### T.Y.B.Sc. Semester VI

Title of the Course and Course Code	BO 369 - Practical based on BO 365 & BO 366
<b>On completion of the course, the students will be able to:</b>	
CO1	Demonstrate techniques for the genetic transformation of plants to introduce new genes and traits, integrating knowledge of biotechnology and plant breeding principles.
CO2	Analyze transgenic plants using molecular techniques such as PCR and Southern blotting to assess the success of genetic modifications.
CO3	Gain hands-on experience in tissue culture methods, including callus induction, shoot regeneration, and somatic embryogenesis, to propagate and improve plant varieties.
CO4	Apply molecular markers for plant genotyping
CO5	Evaluate various plant traits for breeding purposes, focusing on disease resistance, yield, and quality, while applying best practices in seed production and processing.
CO6	Investigate seed germination tests and treatment methods to enhance seed quality, understanding the role of genetic markers in seed technology and breeding advancements.