

JAMAL MOHAMED COLLEGE (AUTONOMOUS),
TIRUCHIRAPPALLI - 620 020

P.G. & RESEARCH DEPARTMENT OF BOTANY
Course Learning Outcomes (CLO) (2018-2019)

B.Sc (BOTANY)

Programme: B. Sc., BOTANY

Programme Outcomes (POs):

- PO1. Critical Thinking:** Apply the knowledge of biology to make scientific queries and enhance the comprehension potential.
- PO2. Effective Communication:** Successful transfer of scientific knowledge both orally and in writing.
- PO3. Social Interaction:** Function as an individual, as a member or a leader to perform a task in class room situation or during field study.
- PO4. Effective Citizenship:** Responsible for learning, develop honesty in work and respect for self and others.
- PO5. Ethics:** Convey and practice social, environmental and biological ethics.
- PO6. Environment and Sustainability:** Insist the significance of conserving a clean environment for perpetuation and sustainable development.
- PO7. Self-directed and Life-long Learning:** study incessantly by self to cope with growing competition for higher studies and employment.

Programme Specific Outcomes (PSOs):

- PSO1.** Educate students in and around Tiruchirappalli, a prime area of Cauvery Delta, about plant science.
- PSO2.** Inculcate strong fundamentals on modern and classical aspects of Botany.
- PSO3.** Build life skills in Edible mushroom cultivation, Biofertilizer production, Greenhouse maintenance and Seed technology through value-added courses.
- PSO4.** Create platform for higher studies in Botany.
- PSO5.** Facilitate students to take-up successful career in Botany.

SEM	COURSE CODE	COURSE	COURSE TITLE	Course Learning Outcomes (CLO)
SEMESTER - I				
I	17UBO 1C1	Core – I	Plant Diversity (Algae, Fungi, and Archegoniate)	<ol style="list-style-type: none"> 1. Discuss about importance of morphological structure, classification, reproduction and economic importance of Algae. 2. Study and impart knowledge about the general Characteristics, structure, reproduction, life history and economic importance of fungi. Understand the features of Lichens. 3. Know the control measures of plant diseases. 4. Students able to explain about structure, classification, reproduction, life cycle and economic importance of Bryophytes. 5. Study and impart knowledge about the Structure, reproduction, life cycle, fossil, fossilization and geological time scale. 6. Students able to explain about structure, classification, reproduction, life cycle and economic importance of Gymnosperms.
	17UBO 1C2P	Core – II	Laboratory Course for Core – I	<ol style="list-style-type: none"> 1. Learn the microscopic technique, familiarize with the external and internal structure of lower and higher group organisms. 2. Study of Lichens and its types. Study of plant diseases causal organisms, and control measures. 3. Students get knowledge in fossil and fossilization.
SEMESTER - II				

II	17UBO 2C3	Core – III	Plant Anatomy and Embryology	<ol style="list-style-type: none"> 1. Plant anatomy and embryology are much awaited subject to study the internal structures and structure & function of reproductive organs in plants. 2. The course paper cover basic aspects of anatomy of plant tissues such as meristems, epidermis, permanent tissues, complex tissue systems and structure of plant organs; reproductive developmental aspects of male reproductive system - Pollen grains, female reproductive system - embryo sac. 3. Students will be benefitted by studying the plant anatomy enables to identify fragmentary plant materials, wood, forensic investigation, and applied aspects of meristems cultures. 4. Students will be able to utilize embryological studies in various aspects like analysis of evolutionary trends, circumscription and delimitation of taxa and making a decision on systematic positions.
	17UBO 2C4P	Core –IV	Laboratory Course for Core III	<ol style="list-style-type: none"> 1. Students able to understand the internal structure of monocot and dicot (stem, leaf and root), secondary thickening, anomalous secondary thickening (Dicot and Monocot) and nodal anatomy. 2. Students get knowledge in internal structure of anther and isolation of endosperm.

SEMESTER - III

III	17UBO3C5	Core– V	Cytology, Genetics and Evolution	<ol style="list-style-type: none"> 1. Acquire knowledge on ultrastructure of cell. 2. Understand the structure and chemical composition of chromatin and concept of cell division. 3. Interpret the Mendel’s principles, acquire knowledge on cytoplasmic inheritance and sex linked inheritance. 4. Understand the concept of ‘one gene one enzyme hypothesis’ along with molecular mechanism of mutation. 5. Interpret the concept of Lemarkism, Neo Lamarkism, Darwinism and also understand the concept of natural selection.
	17UBO3C6P	Core– V	Laboratory Course for Core V	<ol style="list-style-type: none"> 1. The laboratory course gives practical knowledge to perusing students in the field of cytology, genetics and evolution. 2. A cell is the locus of behaviour and that this behaviour has structural basis. Students will be able to observe different cell organelles through electron micrographs from standard articles. 3. Students are capable to acquit practical knowledgeable in histo-chemical tests in starch, sugars and proteins. 4. Student will able be to observe mitosis cell division through the cytological preparation from onion root tips. 5. Working out problems related to genetics will be helpful to students, to solve the problems in plant biology. 6. Students will able to understand how life was survived on earth earlier and how the life has changed over the period. 7. Through Geological time scale students understand the sequence of geological periods in the history of earth. 8. Students will be able to understand the internal structures, determination of age of fossil through prefixed fossil slides.

	17UBO3N1	Non Major Elective- I	Edible Mushroom Cultivation	<ol style="list-style-type: none"> 1. To provide an adequate knowledge about importance and habitation of mushroom. 2. To get knowledge nutritional value, cultivation unit and storage methods. 3. To acquire knowledge about spawn and spawning techniques. 4. To understand the factors influencing the mushroom cultivation and post harvesting methods. 5. Students get detailed knowledge about cost economics, importance and preparation of value added products.
	17UBO3A5	Allied Botany V	Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms	<ol style="list-style-type: none"> 1. To understand general characters and classification of algae. 2. Learn about the general characters, classification, reproduction and life cycle of fungi. 3. To get knowledge about classification, mode of reproduction and detailed study of some important bryophytes. 4. To impart knowledge to general characters, classification and stelar evolution of pteridophytes. 5. Student will able to understand general characters, distribution, classification by spore and detailed study of some genera.
	17UBO3A6P	Allied Botany VI	Laboratory Course for Allied Botany V	<ol style="list-style-type: none"> 1. To study and get knowledge about parts and working principles of compound and dissecting microscope. 2. Students are capable to become practical knowledge about micro-preparation and observation of permanent slides of genera.
SEMESTER - IV				

IV	17UBO 4C7	Core– VII	Plant Molecular Biology	<ol style="list-style-type: none"> 1. Plant Molecular Biology focuses on exploration of molecular basis of plant life. 2. The course paper enlighten mainly on DNA, RNA, Protein, molecular systems and regulation of gene expression in prokaryotic and eukaryotic organisms. 3. Through this course paper students will be able to understand the function of cells at molecular level. 4. The students will be able to apply the molecular knowledge in metabolic engineering of transgenic plant to produce biologically important products. 5. Students will be able to pertain knowledge on molecular breeding methods that are coupled with genetic engineering techniques.
	17UBO 4C8P	Core - VIII	Laboratory Course for Core VII	<ol style="list-style-type: none"> 1. The practical course paper elaborates fundamental skills and techniques in plant molecular biology. 2. It contains more experiments based on general and applied aspects. 3. These experiments will be helpful to student for better understanding of the scientific principles and skillful implementation of the experiments. 4. Students enable to familiarize about the preparation of solutions of different strength. Ex. Buffer. 5. Student will be able to utilize all basic instruments used in molecular biology. 6. Isolation, quantification and storage methods of DNA, RNA and plasmids will be helpful to students to carry out advanced studies like genetic engineering.

	17UBO 4N2	Non Major Elective - II	Landscape gardening	<ol style="list-style-type: none"> 1. This course paper helps the student to understand planning, designing, principles in laying out a garden. 2. The students Gain knowledge of landscape architecture design practices and processes in order to establish the indoor gardening. 3. The Students will be able to design a landscape or interiorscape project. 4. The Students will be able get knowledge about employability skills in the field of gardening. 5. The Students will be able to schedule a landscape or interiorscape maintenance program. 6. The students solve problems and think critically using new knowledge and technological developments in plant propagation methods such as cutting, layering, grafting, budding and micropropagation. 7. The students able to get knowledge about entrepreneurship management about floriculture.
	17UBO 4A7	Allied Botany VII	Angiosperm Taxonomy, Anatomy, Embryology and Plant Physiology	<ol style="list-style-type: none"> 1. Understand external and internal structure of plants. 2. Aware various plant families and its economic importance 3. Get knowledge on structure and development plant embryo. 4. Acquire knowledge on the physiological functions of plants.
	17UBO 4A8P	Allied Botany VIII	Laboratory Course for Allied Botany VII	<ol style="list-style-type: none"> 1. Understand morphological and reproductive characters different plant families. 2. Acquire knowledge on anatomy and developmental biology of the plants. 3. Basic understanding of the physiological mechanisms of plants.
SEMESTER - V				

V	17UBO 5C9	Core – IX	Biochemistry Biophysics and	<ol style="list-style-type: none"> 1. The student Acquires a general knowledge of the physical, chemical properties and metabolism of carbohydrates and lipids in living system. 2. The student knows basic knowledge of the biological importance of the biomolecules such as carbohydrates, lipids, protein, nucleic acid and enzymes. 3. The students will be able to understand the fundamental biochemical principles of enzymes, such as the structure and function of enzymatic process in living system. 4. The student gets knowledge about bio-instruments like, centrifuge, Spectrophotometer, Electrophoresis, Chromatography principle, and be able to apply these instrument mechanisms to the process of experimentation and hypothesis testing in their imminent research field. 5. The student acquires the ability to use mathematical, statistical methods and application relevant to the biological subjects taught, regarding First, Second and third laws of thermodynamics. 6. The student gets knowledge about Photobiology, through this the student will be able to understand the mechanism of photosynthesis.
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	17UBO 5C10	Core – X	Plant Systematics and Economic Botany	<ol style="list-style-type: none"> 1. Understand external structure of plants. 2. Acquire knowledge on classification of plant families, their characteristics and its economic importance.
	17UBO 5C11	Core – XI	Plant Physiology	<ol style="list-style-type: none"> 1. To become knowledgeable in plant and its water relations. 2. Students will able to gain knowledge on role of micronutrients in plant growth, their development and understand the mechanism of nitrogen metabolism. 3. To gain knowledge about chloroplast structure, photosynthetic pigments, the path of energy from the light reactions through Calvin cycle. Students are able to understand the process of translocation of organic solutes in plants. 4. To understand the energy releasing steps in Glycolysis. Students will be familiar about the mechanism of respiration. 5. To acquire knowledge in plant growth regulator and its uses, understand the physiology of flowering and photoperiodism.
	17UBO 5C12 P	Core - XII	Laboratory Course for Core IX, X & XI	<ol style="list-style-type: none"> 1. Students are capable to become practical knowledgeable in estimation of sugars, proteins, lipids and separation of plant pigments by paper chromatography methods. 2. To gain knowledge on various types of inflorescence and fruits, taxonomic families and their useful parts of plants. To understand the economic importance of plants. To acquire knowledge in the preparation of herbarium techniques. 3. Students will experience in plasmolysis, light intensities were influenced on transpiration, stomata size and number are responsible for transpiration rate, different coloured light are important for oxygen evolution, respiration rates are measured by using germinating seeds with Respiroscope.

	17UBO 5M1 A	Major Based Elective – I#	Biostatistics and Bioinformatics	<ol style="list-style-type: none"> 1. To learn the sampling techniques, diagrammatic and graphical representation. 2. To gain knowledge about measures of central tendency and theories of probability. 3. Students acquire knowledge about basics of bioinformatics and online bioinformatics tool. 4. To study and impart the knowledge online available biological databases. 5. Students will able to gain about sequence analysis, alignment and protein structure visualization tools.
	17UBO 5M1 B	Major Based Elective – I#	Enzyme Technology	<ol style="list-style-type: none"> 1. Distinguishing the fundamentals of enzyme nomenclature, classification and various applications of enzymes that can benefit to human life. 2. The student will learn kinetics of enzyme catalysed reactions. 3. The student will be able to perform immobilization of enzymes. 4. Gain knowledge in biosensors and enzyme electrodes. 5. The student will gain knowledge in bioreactors.
	17UBO 5S2A	Skill Based El ective – II**	Biofertilizer Technology	<ol style="list-style-type: none"> 1. Acquired knowledge regarding biofertilizers and its consequences in the environment. 2. Develop skill regarding isolation, identification and mass production of bacterial biofertilizers. 3. Develop skill on blue green algal biofertilizer production and its application. 4. Students will get awareness to mitigate the usage of synthetic fertilizers. 5. Learned about the benefits of organic farming and its relation to waste management.

	17UBO 5S3A	Skill Based Elective – III**	Greenhouse Technology	<ol style="list-style-type: none"> 1. Understand the basic concepts of greenhouse technology. 2. Acquire knowledge on fertilizer application and irrigation systems in greenhouses. 3. Get to know about pest management for greenhouse plants.
	17UBO 5EC1	Extra Credit Course - I	Medicinal Botany	<ol style="list-style-type: none"> 1. Understand different systems of traditional medicines 2. Acquire knowledge on collection and processing of herbal drugs 3. Get knowledge on pharmacological importance of medicinal plants and its bioactive compounds 4. Acquire knowledge on different adulterants.
SEMESTER - VI				
VI	17UBO 6C13	Core - XIII	Microbiology and Plant Pathology	<ol style="list-style-type: none"> 1. Understand the principles and applications of microscopy and classification of micro organisms. 2. Understand the ultrastructure and dynamism of cell. 3. Interpret the different structure of viruses and it's multiplications. 4. Inculcate the importance of plant disease. 5. Identify the causative organism, symptoms and control measure of plant disease.
	17UBO 6C14	Core - XIV	Plant Biotechnology	<ol style="list-style-type: none"> 1. Understand the basic principles of plant tissue culture 2. Acquire knowledge on sources of biomass and bioenergy. 3. Get to know the genetic transformation methods and metabolic engineering

	17UBO 6C15	Core - XV	Plant Ecology and Phytogeography	<ol style="list-style-type: none"> 1. Students learned about the interaction between biotic and abiotic components of the environment. 2. Know about the concept of energy flow in the ecosystem. 3. Students will acquire knowledge regarding vegetation and its analysis. 4. Know about different pollutions, consequences in the environment and its mitigation. 5. Students will know about the floristic regions and plant formation of the planet. 6. Students will deepen the vegetation types of Tamil Nadu.
	17UBO 6C16P	Core - XVI	Laboratory Course for Core XIII, XIV & XV	<ol style="list-style-type: none"> 1. Students will develop skills on isolation of microbes from various sources and staining procedures. 2. Acquired knowledge on the internal structure of diseased plant parts. 3. To know about plant tissue culture media preparation. 4. Student will enlightens regarding plant habitats and its anatomical features by micro preparation technique. 5. Students will develop field skill pertaining to vegetation analysis. 6. To enable the student for quantitative estimation of water samples from different environment.
	17UBO 6M2A	Major Based Elective – II#	Industrial Botany	<ol style="list-style-type: none"> 1. Understand the mass cultivation of single cell protein and useful seaweeds. 2. Acquire knowledge on industrial production of biofuels and its uses. 3. Get knowledge on different mushroom cultivation procedures. 4. Understand the applications of fermentation technology.

	17UBO 6M2B	Seed Science and Technology	Major Based Elective – II#	<ol style="list-style-type: none"> 1. The students able to get knowledge about general system of seed multiplication and seed production agencies. 2. The students gaining knowledge on principles of seed processing, Seed drying and methods. 3. The Students enable to acquires ability to perform pre-and post-quality testing or genetic purity. 4. The students gaining competencies to manage seed production in an agricultural enterprise 5. The Students gaining knowledge on biological and technological aspects of seed production. 6. The students acquire knowledge on Harvest and post-harvest seed treatment- Knowledge on current varieties of field crops, consultant services. 7. The students able to understand the system of seed multiplication and certification.
	17UBO 6M3A	Major Based Elective – III#	Horticulture and Plant Breeding	<ol style="list-style-type: none"> 1. Students get acquire knowledge on classification of horticulture, organic, inorganic and biofertilizers methods of application, garden pest and diseases and their control measure. 2. Students able to explain about plant propagation methods. 3. Students understand garden design, types and cultivation methods of flowers. 4. Students are able to explain about selection methods and hybridization techniques. 5. To gain knowledge about mutation breeding and seed certification.

	17UBO 6M3B	Major Based Elective – III#	Silviculture	<ol style="list-style-type: none"> 1. The students able to integrate social, economic, and ecological objectives into sustainable silviculture management strategies. 2. The student able to apply principles of silviculture and its place in forestry establishment, intermediate operations and their effects on growth and yield. 3. The student able to plan an artificial reforestation program that includes stock type selection; seed and seedling ordering; receiving, handling, and planting of seedlings. 4. The graduates able to discuss applications of Silviculture of economically important species. 5. The students recognize how federal, state, and local laws and regulations govern the practice of forestry and forest operations. 6. The students will able to understand about diagnosis and design of agroforestry systems. 7. The students will able to recognize various harvesting, transportation, and processing systems used in the management of forest resources and production of forest products.
	17UBO 6EC2	Extra Credit Course - II	Wood science and Technology	<ol style="list-style-type: none"> 1. Students learn about physical, chemical and anatomical features of wood. 2. Students will able to identify the soft woods and hard woods. 3. To gain knowledge about physical and mechanical properties of woods. 4. To get acquire knowledge in wood seasoning and preservation of woods. 5. Students will understand wood types.

Programme: M. Sc., BOTANY

Programme Outcomes (POs):

- PO1. Critical Thinking:** Apply the knowledge of biology to make scientific queries and enhance the comprehension potential.
- PO2. Effective Communication:** Successful transfer of scientific knowledge both orally and in writing.
- PO3. Social Interaction:** Function as an individual, as a member or a leader to perform a task in class room situation or during field study.
- PO4. Effective Citizenship:** Responsible for learning, develop honesty in work and respect for self and others.
- PO5. Ethics:** Convey and practice social, environmental and biological ethics.
- PO6. Environment and Sustainability:** Insist the significance of conserving a clean environment for perpetuation and sustainable development.
- PO7. Self-directed and Life-long Learning:** study incessantly by self to cope with growing competition for higher studies and employment.

Programme Specific Outcomes (PSOs):

- POS1.** Obtain strong foundation in classical botany, interdisciplinary subjects such as Agriculture microbiology, Bioinformatics, Biostatistics, Botanical pharmacy, Organic farming and Marine ecology; and advance topics in Plant Biotechnology, Cell and Molecular biology, Biochemistry and Bioinstrumentation.
- PSO2.** Build capacity in Horticulture, Greenhouse management, Production of cut flowers and loose flowers from the elective courses offered.
- POS3.** Prepare for NET/SET examinations to fetch research fellowship/lecturership.
- POS4.** Carry out individual short term project work to acquire knowledge on research using basic and advanced instruments/equipments.
- POS5.** Find opportunities for higher studies in top ranking universities
- POS6.** Gain career in teaching/research in Botany.

M.Sc (BOTANY)

SEM	COURSE CODE	COURSE	COURSE TITLE	Course Learning Outcomes (CLO)
SEMESTER - I				
I	17PBO1C1	CORE I	Plant Diversity I (Thallophytes and Bryophytes)	<ol style="list-style-type: none">1. To impart knowledge about general characters, classification, reproduction methods and life cycles.2. To get knowledge in structure, reproduction and life cycle in the mentioned syllabus.3. The students will be able to know about habit, classification, nutrition and mycorrhizae.4. The students will enable to know the salient features structure, reproduction, life cycle and economic importance of fungi.5. Students receive knowledge about general characters, structure and economic importance of bryophytes. To understand the phylogeny from Bryophytes. To know the evolution of sporophytes in bryophytes.
	17PBO1C2	Core II	Plant Diversity II (Pteridophytes, Gymnosperm and Paleobotany)	<ol style="list-style-type: none">1. Students Gain adequate knowledge on general characters, classification and economic importance of Pteridophytes.2. To study and impart knowledge about the morphology and anatomy of Pteridophytes.3. Students have a good overview of general characters, morphology, reproductive organs, classification and economic importance of Gymnosperms.4. Students will be conversant with general characters, morphology and anatomy of Cycas, Pinus, Podocarpus, Araucaria, Ephedra and Gnetum.5. Student gets knowledge in the methods of fossil and fossilization.

17PBO1C3	Core III	Microbiology, Plant Pathology and Immunology	<ol style="list-style-type: none"> 1. Understand the fundamentals of microscopy, staining technique, classification and control of microbes. 2. Acquire knowledge of external, internal and cultural characters of bacteria. 3. Understand the mechanism of host parasite interaction. 4. Identify the causative agent, symptoms and control measures of plant disease. 5. Acquire the knowledge on defense mechanism, hypersensitivity and auto immunity.
17PBO1C4P	Core IV	Laboratory Course for Core I, II, & III	<ol style="list-style-type: none"> 1. Develop the skill for micro slide preparation and understand the internal structure of algae, fungi and bryophytes. 2. Expertise in media preparation, sterilization, isolation and identification of microbes. 3. Develop skill on isolation of rhizobium from root module and acquire knowledge in methylene blue reduction test. 4. Understand the internal structural variation of pteridophytes and gymnosperms through T.S and L.S. 5. Understand the importance of fossil forms and interprets it's geological type scale.
17PBO1CE1A	Elective – I#	Industrial Botany	<ol style="list-style-type: none"> 1. Understand the advantages of Biofertilizer technology. 2. Acquire knowledge on different biopesticide and their application. 3. Get to know about some useful fermentation products. 4. Learn about common medicinal & aromatic plants in India.

	17PBO1CE1B	Elective - I	Agricultural Microbiology	<ol style="list-style-type: none"> 1. Students learned about the different groups of microorganisms. 2. Students acquired depth of knowledge on microbial interaction and their metabolism. 3. Know about the soil microbial consortium and its role with the environment. 4. Students will be up loaded with importance of microbes and their pivotal role in environmental management. 5. Students will be familiar about fermentation techniques pertaining to industrial products.
SEMESTER - II				
II	17PBO2C5	Core V	Cell and Molecular Biology	<ol style="list-style-type: none"> 1. The course paper focuses on the intricate biological processes dealing with cell biology, cell organelles, cell cycle, cell division, gene expression and their regulation. 2. It brings fundamental concepts as well as recent developments of cell structure, ultra-structure of organelles, cellular activities, physiology and genetic control mechanisms which are basic to understand cellular phenomena. 3. Students will be able to understand the cell structure, organelles, transport of macro-micro molecules and related biochemistry in detail. 4. Students able to understand the activities of organisms at sub cellular level. 5. Students will learn the tools and techniques employed in the study of cell.

	17PBO2C6	Core VI	Plant Anatomy and Embryology	<ol style="list-style-type: none"> 1. To gain knowledge of plant cells, tissues and their functions. 2. The students will enable to know the internal structure of stem, leaf and root in monocot and dicot. 3. Students familiarize in secondary growth, anomalous secondary growth in monocot and dicot stems. 4. Student able to understand the process of microsporogenesis, megasporogenesis and double fertilization. 5. Students able to understand endosperm and its types and know the structure and development of monocot and dicot embryos.
	17PBO2C7	Core VII	Genetics, Evolution and Plant Breeding	<ol style="list-style-type: none"> 1. Understand the fundamentals of Mendal's Principle, sex linkage, crossing over and sex influenced characters. 2. Acquire the knowledge on gene and it's transfer mechanisms and also know the concept of mutation and it's effects. 3. Understand the origin of basic biological molecules and evolution. Interpret the evolution of prokaryotes and origin of eukaryotic cells. 4. Understand the importance and need of crop improvement. 5. Understand the role of mutation in plant breeding and also acquire the knowledge of development of disease resistant variety along with non conventional methods for high yielding variety.

	17PBO2C8P	Core VIII	Laboratory Course for Core V, VI&VII	<ol style="list-style-type: none"> 1. Students are able to gain knowledge in cell and molecular techniques. 2. Students are capable to become practical knowledge in T.S. of stem and Leaf (Monocot and Dicot). To get acquire knowledge in secondary thickening dicot stem and anomalous secondary thickening in the stems. 3. Students get adequate knowledge in internal structure of anther, L.S. of ovule, types of ovules and dicot embryo dissection. 4. Students are able to learn to solve various genetic problems. 5. Students learn about the techniques of emasculation, crossing and bagging.
	17PBO2CE2A	Elective II#	Horticulture and Greenhouse Technology	<ol style="list-style-type: none"> 1. Understand the importance and divisions of horticulture. 2. Learn the various methods of plant propagation. 3. Get to know about commercial horticultural plants. 4. Acquire knowledge on components of Green house technology.
	17PBO2CE2B	Elective II	Floriculture	<ol style="list-style-type: none"> 1. Acquire knowledge on breeding methods in commercially important plants. 2. Understand cut flower production and its advantages. 3. Learn about different types of protected floriculture. 4. Acquire knowledge on value added flower products.
SEMESTER – III				

III	17PBO3C9	Core IX	Plant Physiology	<ol style="list-style-type: none"> 1. Student will be able to understand plant water relations. 2. Students understand the mechanism of photosynthesis and Respiration. 3. Students get acquire knowledge in the mechanism of nitrogen fixation, plant growth regulators and photoperiodism. 4. Students will understand stress types and their mechanism. 5. Students have a detailed knowledge in mechanism of ripening and biological clocks in plants.
	17PBO3C10	Core X	Biochemistry, Biophysics and Bioinstrumentation	<ol style="list-style-type: none"> 1. The students Acquires a general knowledge of the physical, chemical properties and metabolism of carbohydrates and lipids in living system. 2. The students know basic knowledge of the biological importance of the biomolecules such as carbohydrates, lipids, protein, nucleic acid and enzymes. 3. The students will be able to understand the fundamental biochemical principles of enzymes, such as the structure and function of enzymatic process in living system. 4. The student acquires the ability to use mathematical, statistical methods and application relevant to the biological subjects taught, regarding First, Second and third laws of thermodynamics. 5. The student gets knowledge about bio-instruments like, centrifuge, Spectrophotometer, Electrophoresis, Chromatography principle, and be able to apply these instrument mechanisms to the process of experimentation and hypothesis testing in their imminent research field.

	17PBO3C11	Core XI	Plant Systematics and Ethnobotany	<ol style="list-style-type: none"> 1. Understand classical and modern system of classification. 2. Acquire knowledge on molecular tools for classification. 3. Get knowledge on important plant families, their characteristics and its economic importance. 4. Impart knowledge on various tribal groups of Tamilnadu and their ecological knowledge.
	17PBO3C12P	Core XII	Laboratory Course for Core IX, X and XI	<ol style="list-style-type: none"> 1. The laboratory courses help the student to understand and learning principles of laboratory. 2. The Students enable to acquire the practical knowledge about determination, extraction estimation, preparation and measurement of various plant physiological experiments/assay. 3. The students will understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways. 4. The students understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration. 5. In biochemistry, the student gets practical knowledge in order to Preparation of molal, molar, normal and percentage solutions and their dilutions 6. The students gain proficiency in laboratory technique and bio-instrumentation principle, and be able to apply these instrument mechanisms to the process of experimentation in future research field.

	17PBO3CE3A	Elective III#	Bioinformatics and Biostatistics	<ol style="list-style-type: none"> 1. To gain knowledge about the biological databases. 2. To understand the basic model and structure of proteins and amino acids. 3. To enable the students to understand the basic tools of sequence analysis. 4. To learn the hypothesis of basic statistical tests in large sample. 5. To understand the fundamentals of probability and its distribution.
	17PBO3CE3B	Elective III	Biodiversity and Conservation	<ol style="list-style-type: none"> 1. Understand the various concepts of Biodiversity, values and factor influence its loss. 2. They can able to identify the threats to biodiversity and its habitat loss.
	17PBO3EC1	Extra Credit - I	Organic Farming	<ol style="list-style-type: none"> 1. Students will learn about organic farming systems and organic farming methods. 2. Students will familiarize on soil pollution, fertilizer pollution and pesticidal pollution and their effect on soil quality. 3. Students know about the significance of organic farming, organic manures and biofertilizers. 4. Students learn about biogas technologies for organic farming waste, recycled use of water in organic farming and domestic and industrial wastes are used in organic farming system. 5. Students get acquire knowledge in soil conservation, rules and regulations of commercialization of organic products.
SEMESTER – IV				

IV	17PBO4C13	Core XIII	Plant Biotechnology	<ol style="list-style-type: none"> 1. The course paper theoretically elaborates detailed aspects of <i>in vitro</i> culture techniques used genetic engineering of transgenic plants. 2. For curricular development, students will be able to learn the scope of plant tissue culture technology; knowledge in molecular tools such as enzymes nomenclature, different types of vectors, DNA markers and blotting techniques. 3. Students will be able to design the strategies for genetic engineering through modern techniques like electroporation, microinjection and liposome mediated transformation studies. 4. Students will be able understand the specific targets of various products of plant biosynthetic pathways for the production of primary and secondary metabolites, therapeutic proteins in plants.
	17PBO4C14	Core XIV	Plant Ecology and Conservation Biology	<ol style="list-style-type: none"> 1. Understand the basic concepts of plant ecology and our surrounding ecosystem. 2. To identify the natural resources which can be conserve for future and sustainable development.

	17PBO4C15P	Core XV	Laboratory Course for Core XIII & XIV	<ol style="list-style-type: none"> 1. The laboratory course gives practical knowledge to peruse students in the field of plant biotechnology, ecology and conservation biology. 2. In plant tissue culture practical, students will be able to learn the laboratory techniques such as washing, storage of glassware, plastic ware, preparation, sterilization and storage of nutrient media, aseptic manipulation of plant material, and maintenance of cultures under controlled conditions and finally observation of the growth of cultures. 3. Students will be able to understand the practical difficulties in the isolation of plant genomic DNA and Plasmid from bacteria. 4. Students will be able to handle micropipetting, cooling centrifuge and gel electrophoresis and documentation system etc., 5. Practically students able to find out the ecological parameters such as plant species distribution, abundance and density in a defined area by quadrat method. 6. Students will be able to gain knowledge on estimation of dissolved oxygen content, chloride content, carbonate and bicarbonate in water and total dissolved solids and hardness in solid.
	17PBO4CE4A	Elective – IV#	Plant Tissue Culture	<ol style="list-style-type: none"> 1. To gain the knowledge on important techniques about plant tissue culture. 2. Students learn about somatic hybridization techniques and cryopreservation. 3. To study and impart the genetic transformation protocols and its applications. 4. To gain the fundamental knowledge of metabolic engineering of secondary metabolites. 5. To understand the types of bioreactors and its commercial application.

	17PBO4CE4B	Elective – IV#	Marine Ecology	<ol style="list-style-type: none"> 1. The students will be able to understand a knowledge of physical oceanography and biotic factors 2. The student can explain the factors that determine the distribution and abundance of individuals, populations and communities of marine organisms 3. The students apply ecological principles in describing relationships between habitats and organisms in marine environments. 4. The student develops ability to collect, analyse and interpret marine microbial ecological data and their economic importance. 5. The students will be able to develop a knowledge of ecological characteristics and processes in a diversity of marine habitats of mangroves. 6. The student acquires knowledge about Marine Pollution types, sources, need for conservation, human impact, role of global institutions and NGO's role.
	17PBO4PW	Project Work	Dissertation	<ol style="list-style-type: none"> 1. Selection of research topic. 2. Collection and Compilation of literature. 3. Designing of experiment with objectivity. 4. Compilation and interpretation of results. 5. Presentation of research data in different forms. 6. Highlighting results interpretation and discussion. 7. Presentation of report in final form.
	17PBO4EC2	Extra Credit Course - II	Botanical Pharmacy	<ol style="list-style-type: none"> 1. Students gain adequate knowledge on cultivation, collection, processing and utilization of medicinal plants. 2. To impart knowledge analytical methods, drug adulteration and evaluation of drugs. 3. Students get knowledge about pharmaceutical plant products. 4. Students understand various types of secondary metabolites. 5. To impart knowledge about nutraceuticals, cosmoceuticals and immunomodulators of natural products.

M. Phil BOTANY

Programme: M. Phil., BOTANY

Programme Outcomes (POs):

- PO1. Critical Thinking:** Apply the knowledge of biology to make scientific queries and enhance the comprehension potential.
- PO2. Effective Communication:** Successful transfer of scientific knowledge both orally and in writing.
- PO3. Social Interaction:** Function as an individual, as a member or a leader to perform a task in class room situation or during field study.
- PO4. Effective Citizenship:** Responsible for learning, develop honesty in work and respect for self and others.
- PO5. Ethics:** Convey and practice social, environmental and biological ethics.
- PO6. Environment and Sustainability:** Insist the significance of conserving a clean environment for perpetuation and sustainable development.
- PO7. Self-directed and Life-long Learning:** study incessantly by self to cope with growing competition for higher studies and employment.

Programme Specific Outcomes (PSOs):

- POS1.** Master the research methodology and research techniques
- POS2.** Carry out research projects individually and acquire knowledge on instrument handling and thesis writing.
- POS3.** Prepare for NET/SET examinations to fetch research fellowship/lecturership.
- POS4.** Find opportunities for higher studies in top ranking universities
- POS5.** Gain career in teaching/research in Botany.

SEM	COURSE CODE	COURSE	COURSE TITLE	Course Learning Outcomes (CLO)
SEMESTER - I				
I	17MPBO1C1	Core I	Research Methodology	<ol style="list-style-type: none"> 1. Understand the principle and applications of microscopy and also observe the ultra structure of cell and cell organelles. 2. Analyze the functional groups of plants and microbial products through spectral analysis, radioactive contamination and environmental level of radio activity are monitored through scintillation and gm counter. 3. Understand the importance and mechanism of separation technique and molecular technique for compound isolation and diagnosis of infectious disease. 4. Statistical methods are used to analyze the research data further interpretation of findings. 5. Inculcate complete knowledge of research.
	17MPBO1C2	Core II	Advances in Plant Science	<ol style="list-style-type: none"> 1. Understand the fundamental aspects of plant cell and molecular biology. 2. Acquire knowledge on bioinformatics tools. 3. Get to know about the physiology and biochemistry of plants 4. Understand the concepts of plant biotechnology. 5. Know the importance of plant biodiversity and conservation.
	17MPBO1C3	Core III	Guide Paper	<ol style="list-style-type: none"> 1. To get specialized in the chosen area of project/research work.

	17MPBO1C4	Core IV	Teaching and Learning Methodology	<ol style="list-style-type: none"> 1. Students understand the objectives and role of higher education. 2. Students having considerable proficiency in higher education. 3. Students know about the importance of teaching technology designs. 4. Students get able knowledge in remedial teaching and causes of reading disability. 5. To get acquired knowledge in principles of guidance, counseling and vocational guidance.
SEMESTER - II				
II	17MPBO2PW	Project Work	Dissertation	<ol style="list-style-type: none"> 1. To enable the student to develop deeper knowledge, understanding, capabilities and attitude in the context of research. 2. To know about selection of research topic. 3. To enable the student towards collection and compilation of literature. 4. Designing the experiment with clear objectivity. 5. Demonstrate the ability to collate and critically assess/interpret data. 6. Develop an ability to effectively communicate knowledge in a scientific manner. 7. Provide recommendations based on research findings.