

Department of PG Botany
Nesamony Memorial Christian College, Marthandam
M. Sc. Botany
Course Outcome

Semester – I M. Sc. Botany					
Part	Course Name	Course Code	Credit	Hours	Course Outcome
Part - A	Core – I: Plant Diversity - I: Algae, Fungi, Lichens and Bryophytes	VBOC11	5	7	On completion of this course, the students will be able to CO1 Relate to the structural organizations of algae, fungi, lichens and bryophytes CO2 Demonstrate both the theoretical and practical knowledge in understanding the diversity of basic life forms and their importance CO3 Explain life cycle patterns in algae, fungi, lichens and Bryophytes CO4 Compare and contrast the mode of reproduction in diverse groups of basic plant forms. CO5 Discuss and develop skills for effective conservation and utilization of lower plant forms
	Core - II: Plant Diversity - II: Pteridophytes, Gymnosperms and Paleobotany	VBOC12	5	7	On completion of this course, the students will be able to CO1 Recall on classification, recent trends in phylogenetic relationship, General characters of Pteridophytes and Gymnosperms. CO2 Learn the morphological/anatomical organization, life history of major types of Pteridophytes and Gymnosperms CO3 Comprehend the economic importance of Pteridophytes, Gymnosperms and fossils. CO4 Understanding the evolutionary relationship of Pteridophytes and Gymnosperms. CO5 Awareness on fossil types, fossilization and fossil records of Pteridophytes and Gymnosperms
	Core - III: Laboratory Course - 1: Covering Core Paper - I	VBOL11	2	3	On completion of this course, the students will be able to CO1 Recall and applying the basic keys to distinguish at species level Identification of important Algae and fungi through its structural organizations CO2 Demonstrate practical skills in thallophytes. CO3 Describe the structure of algae, fungi, lichens and bryophytes CO4 Determine the importance of structural diversity in the evolution of plant forms. CO5 Formulate techniques to isolate and culture of alga and fungi as well as to understand the diversity of plant forms

	Core - IV: Laboratory Course – 2 Covering Core Paper - II	VBOL12	2	3	On completion of this course, the students will be able to CO1 Recall and applying the basic keys to distinguish at species level Identification of important algae and fungi through its structural organizations CO2 Demonstrate practical skills in thallophytes. CO3 Describe the structure of algae, fungi, lichens and bryophytes CO4 Determine the importance of structural diversity in the evolution of plant forms. CO5 Formulate techniques to isolate and culture of alga and fungi as well as to understand the diversity of plant forms
	Elective - I: Microbiology, immunology and plant pathology	VBOE11	3	5	On completion of this course the student will be able to CO1 Recognize the general characteristics of microbes, plant defense and immune cells CO2 Explain about the stages in disease development and various defense mechanisms in plants and humans. CO3 Elucidate concepts of microbial interactions with plant and humans. CO4 Analyze the importance of harmful and beneficial microbes and immune system CO5 Determine and interpret the detection of pathogens and appreciate their adaptive strategies.
	Elective - II: Horticulture	VBOE17	3	5	On completion of this course, the students will be able to: CO1 Identify and categorize various horticultural plants and the conditions that affect their growth and productivity. CO2 Explain the various structures and growth processes of horticultural plants. CO3 Demonstrate the propagation, growth, and maintenance of plants in horticulture systems. CO4 Correlate the soil characteristics and fertility to good plant growth. K4 CO5 Utilize the role plant tissue culture techniques in the production of quality planting stock in horticulture. CO6 Apply horticultural skills and knowledge to explore career opportunities in horticulture industry
Semester – II M. Sc. Botany					
Part - A	Core – V: Taxonomy of Angiosperms and Economic Botany	VBOC21	4	5	On completion of this course, the students will be able to CO1 Recollect the basic concepts of morphology of leaves, flowers. Identify the types of compound leaves, inflorescence and fruits Describe their characteristic features CO2 Explain the principles of taxonomy. Summarize the taxonomic hierarchy. Define Binomial nomenclature. Group Activity –Construct key preparation CO3 Explain the various types of classification. Distinguish its advantages and disadvantages Construction of floral formula and floral diagram.

					<p>CO4 Illustrate and explain the characteristic features and list out the economic importance of the families Field trip to local botanical garden and regional botanical garden.</p> <p>CO5 Illustrate and explain the characteristic features and list out the Economic importance of the families.</p>
Core - VI: Plant Anatomy and Embryology of Angiosperms	VBOC22	4	5	<p>On completion of this course, the students will be able to</p> <p>CO1 Learn the structures, functions and roles of apical vs lateral meristems in monocot and dicot plant growth.</p> <p>CO2 Study the function and organization of woody stems derived from secondary growth in dicot and monocot plants.</p> <p>CO3 Apply their idea on sectioning and dissection of plants to demonstrate various stages of plant development.</p> <p>CO4 Understand the various concepts of plant development and reproduction.</p> <p>CO5 Profitably manipulate the process of reproduction in plants with a professional and entrepreneurial mindset.</p>	
Core - VII: Ecology, phytogeography, Conservation Biology and Intellectual property rights	VBOC23	4	5	<p>On completion of this course, the students will be able to</p> <p>CO1 Understand the scope and importance of population ecology, plant communities and ecosystem ecology</p> <p>CO2 Understand the applied aspect of environmental botany.</p> <p>CO3 Identify different plant communities, categorize plant biomes and identify threatened, endangered plant species and create awareness program in protection of biodiversity.</p> <p>CO4 Illustrate and explain the characteristic features and list out the economic importance of the families Field trip to local botanical garden and regional botanical garden.</p> <p>CO5 Analyze insight into the vegetation types, species interaction and their importance and the factors influencing the environmental conditions</p>	
Core - VIII: Laboratory course - 3 Covering Core Paper V	VBOL21	2	3	<p>On completion of this course, the students will be able to</p> <p>CO1 To gain recent advances in plant morphological and floral characteristics.</p> <p>CO2 Understand about different floral characteristics and artificial key preparation which employed for plant identification and conservation.</p> <p>CO3 Identification of genus and species of locally available wild plants.</p> <p>CO4 Familiarize immense knowledge on economic importance of higher plants.</p> <p>CO5 Gain hands on experience on herbarium preparation techniques.</p>	
Core - IX: Laboratory course – 4 Covering Core Papers	VBOL22	2	3	<p>On completion of this course, the students will be able to</p> <p>CO1 Recall or remember the information including basic and advanced in relation with plant</p>	

	VI and VII				<p>anatomy and embryology.</p> <p>CO2 Apply their idea on sectioning and dissection of plants to demonstrate various stages of plant development.</p> <p>CO3 Know about different vegetation sampling methods.</p> <p>CO4 Know about the water and soil analysing technique</p> <p>CO5 Gain knowledge about the remote sensing and mapping</p>
	Elective - III: Research methodology, computer applications & bioinformatics	VBOE23	2	3	<p>On completion of this course, the students will be able to</p> <p>CO1 Realize the need of centrifuges and chromatography and their uses in research.</p> <p>CO2 Learn the principles and applications of electrophoresis</p> <p>CO3 Construct the phylogenetic trees for similar characteristic feature of \ plant genomes and study de novo drug design through synthetic biology.</p> <p>CO4 Understand the concept of pairwise alignment of DNA sequences using algorithms.</p> <p>CO5 Interpret the features of local and multiple alignments.</p>
	Elective - IV: Nanobiotechnology	VBOE28	2	3	<p>On completion of this course, the students will be able to</p> <p>CO1 Recall the essential features of biology and nanotechnology that are converging to create the new area of bio nanotechnology.</p> <p>CO2 Formulate procedures for the synthesis of nanoparticles which are of medical importance which could be used to treat specific diseases.</p> <p>CO3 Characterize the various types of nano particle synthesis and advocate promotes the use of nano materials and anno composites.</p> <p>CO4 Analyze and apply the important of nanoparticles in plant diversity.</p> <p>CO5 Construct various types of nanomaterial for application and evaluate the impact on environment.</p>
	SEC - I: Agriculture and Food Microbiology	VBOSE21	2	3	<p>on completion of this course, the students will be able to</p> <p>CO1 Recognize the general characteristics of microbes and factors affecting its growth</p> <p>CO2 Explain the significance of microbes in increasing soil fertility</p> <p>CO3 Elucidate concepts of microbial interactions with plant and food.</p> <p>CO4 Analyze the impact of harmful microbes in agriculture and food Industry.</p> <p>CO5 Determine and appreciate the role of microbes in food preservation and as bio control.</p>
Semester – III M. Sc. Botany					
Part - A	Core – X: Cell and Molecular Biology	WBOM31	4	5	<p>On completion of this course, the students will be able to:</p> <p>CO1 Recall a plant cell structure and explain its function.</p> <p>CO2 Illustrate and explain the structure of various cell organelles.</p>

					<p>CO3 Explain the structure and functional significance of nucleic acid.</p> <p>CO4 Compare and contrast the DNA replication (prokaryotes and eukaryotes), enzymes involved in replication, DNA repair</p> <p>CO5 Discuss and develop skills for DNA/gene manipulating and the enzymes involved</p>
Core - XI: Genetics, Plant Breeding & Biostatistics	WBOM32	4	5	<p>On completion of this course, the students will be able to:</p> <p>CO1 Understand the Mendal's Law of inheritance and gene interactions</p> <p>CO2 Analyze the various factors determining the heredity from one generation to another.</p> <p>CO3 Explain Gene mapping methods: Linkage maps.</p> <p>CO4 Compare and contrast the genetic basis of breeding self- and cross-pollinated crops.</p> <p>CO5 Discuss and develop skills for statistical analysis of biological problems.</p>	
Core - XII: Recombinant DNA technology and industrial applications	WBOM33	4	5	<p>On completion of this course, the students will be able to:</p> <p>CO1 Understand the basics of recombinant DNA technology</p> <p>CO2 Demonstrate and to recollect the production of vitamins</p> <p>CO3 Analyze the production of antibiotics.</p> <p>CO4 Compare and contrast the recombined organism and natural organisms.</p> <p>CO5 Create and develop skills for rDNA techniques and in producing hybrids varieties</p>	
Core - XIII: Laboratory course - 5 Covering Core Papers X and XII	WBOL31	2	2	<p>On completion of this course, the students will be able to:</p> <p>CO1 Recall or remember the various aspects of cell biology, molecular biology, and r-DNA technology.</p> <p>CO2 Understand various concepts of cell biology, and molecular biology.</p> <p>CO3 Apply the theory knowledge gained into practical mode in order to acquire applied knowledge by day-to-day hands-on experiences</p> <p>CO4 Analyze or interpret the results achieved in practical session in the context of existing theory and knowledge.</p> <p>CO5 Evaluate the theory and practical skills gained during the course</p>	
Core - XIV: Laboratory course - 6 Covering Core Paper XI	WBOL32	2	2	<p>On completion of this course, the students will be able to:</p> <p>CO1 Recall or remember the various aspects of cell biology, genetics, molecular biology, plant breeding and tissue culture.</p> <p>CO2 Understand various concepts of cell biology, genetics, plant breeding and tissue culture.</p> <p>CO3 Apply the theory knowledge gained into practical mode in order to acquire applied knowledge by day-to-day hands-on experiences</p> <p>CO4 Analyze or interpret the results achieved in practical session in the context of existing theory and knowledge.</p>	

					CO5 Evaluate the theory and practical skills gained during the course.
	Core - XV: Industrial Botany	WBOM34	4	5	On completion of this course, the students will be able to: CO1 Understand the basics of algae in industrial applications. CO2 Demonstrate and to recollect the uses in fungi in industries CO3 Explain bacterial role in industries. CO4 Compare and contrast the use of plants in industries. CO5 Discuss and develop skills for working in industries specializing in biomolecules.
	Elective - V: Entrepreneurial Opportunities in Botany	WBOE32	2	3	On completion of this course, the students will be able to: CO1 Students can acquire knowledge about organic farming and their advantages. CO2 Analyze both the theoretical and practical knowledge in understanding various horticultural techniques CO3 To develop kitchen garden or terrace garden in their living area. CO4 Evaluate the horticultural techniques to students can develop self employment and economical improvement CO5 Create and develop skills for mushroom cultivation.
	SEC - II: Professional Communication Skill (2)	WBOSE32	2	3	On completion of this course, the students will be able to: CO1 Students are trained to convert the conceptual understanding of communication into every day practice. CO2 Students are expected to be ready for placements. CO3 Students are prepared to communicate their ideas relevantly and coherently in professional writing CO4 The skills of Speaking will be developed conducting various communicative Activities- Role play, conversations, extempore etc. CO5 The skills of Writing will be developed and assessed on Text based writing.
	Internship / Industrial Activity (Carried out in Summer Vacation at the end of I year– 30 hours)		2		On completion of this course, the students will be able to: CO1 For students in those pertinent core areas, the Internship / Field Visit/ Industrial Visit / Research Knowledge Updating activity is preparing them to become professionals after graduation. CO2 Compile data and familiarize yourself with techniques for planning and carrying out tests. CO3 Collect data and educate yourself on how to analyze the results of your scientific studies. CO4 This in-the-moment industrial exposure helps them become more knowledgeable and skilled in the latest technology. CO5 Improving communication skills and coming up with creative ideas are crucial components of

					training that help someone become an entrepreneur.
Semester – IV M. Sc. Botany					
Part - A	Core –XVI: Plant Physiology and Plant metabolism	WBOM41	5	5	On completion of this course, the students will be able to CO1 Relate understand properties and importance of water in biological system, nutrients and its translocation. CO2 Demonstrate the importance of light in plant growth and the harvest of energy. CO3 Explain the energy requirement and nitrogen metabolism. CO4 Compare the various growth regulators that influence plant growth. CO5 Discuss the senescence and plant response to environmental stress.
	Core -XVII: Biochemistry & Applied Biotechnology	WBOM42	5	5	On completion of this course, the students will be able to CO1 Knowledge on the fundamentals and significance of Plant Biochemistry CO2 Understanding on the structure and properties of plant biomolecules. CO3 Explain the role of enzymes in plants. CO4 Compare and contrast the methods of transgenic plants production and natural plants. CO5 Discuss and develop skills for effective utilization of microbial/plant enzymes and their role in biological cells
	Core -XVIII: Laboratory course – 7 Covering Core Paper XVI	WBOL41	2	2	On completion of this course, the students will be able to CO1 Perform quantitative tests for photosynthetic pigments CO2 Develop skill on the plant physiology experimental analysis CO3 Understanding on the basic principles of physiology by doing demonstration experiments CO4 Got hands on training on the chromatographic technique CO5 Evaluate the theory and practical skills gained during the course and create idea to seek for suitable job in relevant industries
	Core -XIX: Laboratory course- 8 Covering Core Paper XVII	WBOL42	2	2	On completion of this course, the students will be able to CO1 Knowledge on the fundamentals and significance of Plant Biochemistry CO2 Understanding on the structure and properties of plant biomolecules. CO3 Explain the role of enzymes in plants. CO4 Compare and contrast the methods of transgenic plants production and natural plants. CO5 Discuss and develop skills for effective utilization of microbial/plant enzymes and their role in biological cells
	Core -XX: Project with Viva Voce	WBOP41	4	8	On completion of this course, the students will be able to CO1 For students in those pertinent core areas, the project is preparing them to become professionals after graduation

					<p>CO2 Compile data and familiarize yourself with techniques for planning and carrying out tests</p> <p>CO3 Collect data and educate yourself on how to evaluate the analyzed results of your scientific studies</p> <p>CO4 In-the-moment industrial exposure helps them become more knowledgeable and skilled in the latest technology.</p> <p>CO5 Improving communication skills and coming up with creative ideas are crucial components of training that help someone become an entrepreneur</p>
	Elective - VI: Gene Cloning and Gene Therapy	WBOE43	2	4	<p>On completion of this course, the students will be able to</p> <p>CO1 Recollect the basic concepts of gene cloning</p> <p>CO2 Demonstrate and to identify the selection of clones</p> <p>CO3 Acquire knowledge on the gene therapy.</p> <p>CO4 Compare and understand the concept of gene therapy.</p> <p>CO5 Discuss and develop skills for hybrid seed production and molecular farming.</p>
	SEC - III: Botany for competitive examinations (NET/UGC-SIR/SET/TRB/UPSC/TNPSC)	WBOSE41	2	4	
Part - C	Extension Activity		1		