

## Program - Master of Science (M.Sc. Botany) 2022 onwards

Program, Program specific and Course outcomes

### PROGRAM learning OUTCOMES (PO)

PO-1	Postgraduates of diverse, interrelated, and interdisciplinary knowledge will be produced to serve mankind through the dissemination of their acquaintance and learning in both basic and advanced aspects of sciences.
PO-2	Students will acquire combined theoretical, conceptual, analytical, and experimental knowledge and skills in both basic and applied areas of science to promote innovation and discovery.
PO-3	Students will be able to have a strong research aptitude, pursue independent research and contribute to the growth and development of emerging skill-oriented areas of science.
PO-4	To enhance students' capability to develop solutions for the welfare of human life and environmental problems through the applications of acquired knowledge and skills.
PO-5	Students will be acquainted to make observations and collect data both in the laboratory and in the field and evaluate the results, derive conclusions, and communicate their findings effectively in the form of research papers, project reports, patents, and policy documents.
PO-6	To promote the proficiency of learning through ICT-based digital platforms and educate other computer-based applications for the popularization of self and business.

### M.Sc. Botany - PROGRAM SPECIFIC OUTCOMES (PSO)

After the successful completion of M.Sc. Botany program, **the students are expected to demonstrate comprehensive knowledge and skills in the following:**

PSO-1	Be proficient in basic, modern, and applied areas of Botany along with critical and reflective thinking and problem-solving potentials.
PSO-2	Able to differentiate various divisions of plants in relation to origin, structure, development, and functions; demonstrate disciplinary knowledge
PSO-3	Have vertical knowledge and analytical abilities in fundamental (Evolution, Diversity), and applied (Horticulture, Phytochemistry, Instrumentation, Bioenergy, Plant Biotechnology) areas of Botany.
PSO-4	Possess across subject knowledge through self-directed learning to enhance their

	skills and employability
PSO-5	Ability to understand and apply analytical and scientific reasoning towards the conduct of experiments, data collection, interpretation, and arriving at a conclusion in an unbiased ethical manner
PSO-6	Be capable in digital literacy through appropriate botany-related (ICT, Biostatistics, Bioinformatics, Phylogeny) and other software; reporting of findings and effective communication.

<b>Title of the Course</b>	:	<b>Plant Diversity-I: Algae, Fungi and Lichens</b>				
<b>Course Code</b>	:	<b>PBYC11</b>				
<b>Course objectives:</b> To teach the students on						
<ol style="list-style-type: none"> <li>1. thallus organization, evolution and life cycle patterns of algae</li> <li>2. salient features and types of selected algae and their economic importance</li> <li>3. evolution, role of sex hormone in fungi and heterothallism in fungi</li> <li>4. general account, phylogeny of fungi and their role in environment</li> <li>5. the structure and types of lichens and their mutualism</li> </ol>						
	<b>CO Statement: Students would have understood</b>					Knowledge Level
CO -1	the outline and illustration of the types of non-vascular cryptogams					K1-K3
CO -2	the demonstration of the vegetative and reproductive structure of the thallophytes					K1-K4
CO -3	the examination of ultrastructure and spore dispersal mechanism of fungi					K1-K4
CO -4	the evolution of sporophytes and sporophytes of thallophytes					K1-K4
CO -5	the characteristic features of Lichen and their economic importance					K1-K4
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Plant Diversity II (Bryophytes, Pteridophytes, Gymnosperms and Paleobotany)</b>				
<b>Course Code</b>	:	<b>PBYC12</b>				
<b>Course objectives:</b> To enable the students to						
<ol style="list-style-type: none"> <li>1. have a comprehensive knowledge (Structure, reproduction and life cycle) of Bryophytes and get familiar with the classification.</li> <li>2. learn the salient features of Pteridophytes, evolution of stele and its classification.</li> </ol>						

3. understand the general and reproductive characters of Gymnosperms with economic importance.
4. acquire the knowledge of classification and types studies in Gymnosperms.
5. learn about geological time scale, methods of fossilization and salient features of fossil forms of Pteridophytes and Gymnosperms.

	<b>CO Statement: Students would have understood</b>	Knowledge Level
CO -1	classification, characteristic and comparative features of the specified orders and economic importance of Bryophytes	K1-K3
CO -2	classification, characteristic features of the specified orders, evolution of stele types, comparative features of sporophytes and gametophytes and economic importance of Pteridophytes	K1-K3
CO -3	the reproductive structures, development of male and female gametes, embryogeny and economic importance of Gymnosperms.	K1-K3
CO -4	classification, characteristic and comparative features of the specified orders of Gymnosperms.	K1-K3
CO -5	the geological time scale, fossilization methods and of fossil forms.	K1-K3

<b>Title of the Course</b>	<b>:</b>	<b>Plant Diversity I &amp; II</b>
<b>Course Code</b>	<b>:</b>	<b>PBYL11</b>
<b>Course objectives:</b> To enable the students in understanding		
<ol style="list-style-type: none"> <li>1. Vegetative and reproductive structures of selected algal species</li> <li>2. Morphology and reproductive structures of fungal species</li> <li>3. The anatomical structure and morphology of bryophytes</li> <li>4. Structural details of the vegetative and reproductive parts of pteridophytes and gymnosperms</li> <li>5. the past history and evolution of plants through fossils</li> </ol>		
	<b>CO Statement: Students will be able to understand, gain knowledge, apply and analyse</b>	Knowledge Level
CO -1	the vegetative and reproductive structure of micro and macro algae	K1-K5
CO -2	the vegetative and reproductive structure of fungi	K1-K5
CO -3	the characters of Pteridophytes and Gymnosperms	K1-K5

CO -4	the evolutionary history of bryophytes, pteridophytes and gymnosperms					K1-K5
CO -5	the Bryophytes, Pteridophytes and Gymnosperms from other plant groups through filed collection					K1-K5
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Microbiology</b>				
<b>Course Code</b>	:	<b>PBYC13</b>				
<b>Course objectives: Enable the students to:</b>						
Learn the historical developments in the field of microbiology, types of microbes and their classification, and the structure of selected microbes						
<ol style="list-style-type: none"> <li>1. study the nutritional behavior and methods to cultivate the microbes</li> <li>2. understand how the microbes exchange genetic information and its consequence</li> <li>3. Acquire the knowledge on nature and classification viruses and their importance in causing plant and human diseases.</li> <li>4. comprehend the human immunological response to microbial infections</li> </ol>						
	<b>CO Statement: After successful completion of the course, the student will be able to</b>					Knowledge Level
CO -1	Appreciate the co-existence of microbes in our environment and distinguish them based on the structural and functional features.					K1-K3
CO -2	understand the nutritional behavior of microbes and design media to cultivate microbes					K1-K5
CO -3	recognize how and why the microbes exchange genetic material; and the way to exploit such exchange for the benefit of cloning purposes					K1-K5
CO -4	differentiate the viruses from other microbes, understand the infection mechanism and classification of viruses					K1-K4
CO -5	comprehend the mechanism by which human body fights a pathogenic infection or an antigen; and the components of such a defense system					K1-K3
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Cell and Molecular Biology</b>																		
<b>Course Code</b>	:	<b>PBYC14</b>																		
<b>Course objectives: To provide students an understanding on</b>																				
<ol style="list-style-type: none"> <li>1. Cell theory, structure and function of cells and its elements, mainly physicochemical properties of the organelles.</li> <li>2. Membrane organization and signaling mechanism of the prokaryotic and eukaryotic cell.</li> <li>3. Structure and function of nucleus and its parts, phases of cell cycle and its regulation, cell division, specialized chromosomes and banding patterns.</li> <li>4. Basic organization of genetic material and the realms of events accompanied with replication and gene expression.</li> <li>5. Mechanism of transcription, translation and post translational modifications of proteins.</li> </ol>																				
<table border="1"> <thead> <tr> <th></th> <th><b>CO Statement: Students would have understood the</b></th> <th><b>Knowledge Level</b></th> </tr> </thead> <tbody> <tr> <td>CO -1</td> <td>Basic structure and functions of unit of life and its components.</td> <td>K1-K4</td> </tr> <tr> <td>CO -2</td> <td>Cell membrane organization and signaling mechanism in prokaryotes and eukaryotes.</td> <td>K2-K4</td> </tr> <tr> <td>CO -3</td> <td>Details of nucleus, chromosomes, DNA packaging, cell cycle and cell division.</td> <td>K1-K5</td> </tr> <tr> <td>CO -4</td> <td>DNA as a genetic material, physicochemical properties of nucleic acids and its replication mechanism.</td> <td>K2-K5</td> </tr> <tr> <td>CO -5</td> <td>To acquire the knowledge of transcription and translation.</td> <td>K2-K4</td> </tr> </tbody> </table>				<b>CO Statement: Students would have understood the</b>	<b>Knowledge Level</b>	CO -1	Basic structure and functions of unit of life and its components.	K1-K4	CO -2	Cell membrane organization and signaling mechanism in prokaryotes and eukaryotes.	K2-K4	CO -3	Details of nucleus, chromosomes, DNA packaging, cell cycle and cell division.	K1-K5	CO -4	DNA as a genetic material, physicochemical properties of nucleic acids and its replication mechanism.	K2-K5	CO -5	To acquire the knowledge of transcription and translation.	K2-K4
	<b>CO Statement: Students would have understood the</b>	<b>Knowledge Level</b>																		
CO -1	Basic structure and functions of unit of life and its components.	K1-K4																		
CO -2	Cell membrane organization and signaling mechanism in prokaryotes and eukaryotes.	K2-K4																		
CO -3	Details of nucleus, chromosomes, DNA packaging, cell cycle and cell division.	K1-K5																		
CO -4	DNA as a genetic material, physicochemical properties of nucleic acids and its replication mechanism.	K2-K5																		
CO -5	To acquire the knowledge of transcription and translation.	K2-K4																		

<b>Title of the Course</b>	:	<b>Microbiology, Cell and Molecular Biology</b>						
<b>Course Code</b>	:	<b>PBYL12</b>						
<b>Course objectives: Enable the students to</b>								
<ol style="list-style-type: none"> <li>1. understand the concepts of media sterilization, culturing of bacteria and differential staining of bacteria.</li> <li>2. isolate the bacteria from different environmental matrices and evaluate the impacts of physical and chemical factor on the bacterial growth</li> <li>3. determine microbial populations from soil and water matrices; and screening of microbes for specific functions.</li> <li>4. perform extraction of DNA and clone and transform into a <i>E. coli</i> cell</li> <li>5. study cell division types - mitosis and meiosis in plants</li> </ol>								
<table border="1"> <thead> <tr> <th></th> <th><b>CO Statement: After successful completion of this course, student will be able to</b></th> <th><b>Knowledge Level</b></th> </tr> </thead> <tbody> <tr> <td>CO -1</td> <td>prepare and sterilize media, culture bacteria and staining through Gram staining</td> <td>K1-K5</td> </tr> </tbody> </table>				<b>CO Statement: After successful completion of this course, student will be able to</b>	<b>Knowledge Level</b>	CO -1	prepare and sterilize media, culture bacteria and staining through Gram staining	K1-K5
	<b>CO Statement: After successful completion of this course, student will be able to</b>	<b>Knowledge Level</b>						
CO -1	prepare and sterilize media, culture bacteria and staining through Gram staining	K1-K5						

CO -2	isolate the bacteria from different environmental matrices and obtain pure culture					K1-K5
CO -3	determine microbial populations from soil and water matrices; and screening of microbes for specific functions.					K1-K5
CO -4	clone and transform into a <i>E. coli</i> cell					K1-K6
CO -5	study cell division types - mitosis and meiosis in plants					K1-K3
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Evolutionary Biology</b>				
<b>Course Code</b>	:	<b>PBYEA</b>				
<b>Course objectives:</b> To teach students on						
<ol style="list-style-type: none"> <li>1. Origin, evolution and early history of living organisms, evolutionary theories, experiments and concepts</li> <li>2. Origin and selection of species based on Darwin's theory and human evolution</li> <li>3. Evolutionary genetics and extinction of species</li> <li>4. Origin and life cycle of non-vascular and vascular plants</li> <li>5. Evidences of evolution based on fossil records</li> </ol>						
	<b>CO Statement: Students will be able to</b>					Knowledge Level
CO -1	understand the Origin, evolution and early history of living organisms, evolutionary theories, experiments and concepts					K1-K2
CO -2	gain knowledge on the Origin and selection of species based on Darwin's theory and human evolution					K1, K3
CO -3	analyse and interpret the evolutionary genetics and extinction of species					K2-K4
CO -4	comprehend how plants originated and remember the life cycle of non-vascular and vascular plants					K2-K5
CO -5	appreciate the evolution of all living organisms based on available fossil and experimental evidences					K2-K5
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Anatomy and Embryology of Angiosperms</b>
<b>Course Code</b>	:	<b>PBYC21</b>
<b>Course objectives:</b>		
<ol style="list-style-type: none"> <li>1. To provide insights into basic concepts of development and internal structures of the most evolved group of plants, the angiosperms.</li> <li>2. To know salient features and evolutionarily advanced anatomical and reproductive characteristics of angiosperms through molecular biology.</li> <li>3. To understand the structure, growth, development and reproduction of angiosperms.</li> <li>4. To get an insight in to pollination, fertilization and post-fertilization changes takes place in angiosperms through biochemistry.</li> <li>5. To familiarize with plant histo-chemistry with special reference to various stains and staining procedures.</li> </ol>		
	<b>CO Statement: Students will be able to remember, understand, apply and analyse</b>	<b>Knowledge Level</b>
CO -1	Basic concepts of origin, development, fate and functions of range of cells and tissues of angiosperms.	K1-K4
CO -2	Morphogenesis and organogenesis of angiosperms and molecular aspects of growth and development	K1-K4
CO -3	Vegetative, sexual reproductions, and micro-, and megasporogenesis of angiosperms	K1-K4
CO -4	Pollination mechanisms and biochemistry of fruit maturation and seed germination	K1-K5
CO -5	Preparation and use of selected natural and synthetic stains to understand the internal structures of angiosperms	K1-K5

<b>Title of the Course</b>	:	<b>Instrumentation and Research Methodology</b>
<b>Course Code</b>	:	<b>PBYC22</b>
<b>Course objectives:</b> To enable the students		
<ol style="list-style-type: none"> <li>1. To understand the know how's on principles and practical knowledge onpH and EC, spectroscopy and chromatography.</li> <li>2. To understand the principles and applications of electrophoresis, microscopy, centrifugation and blotting techniques</li> <li>3. To understand the principles of data management and statistical analysis.</li> <li>4. To understand the theory of microtome, sectioning and staining</li> <li>5. To understand the types of research and ethics relevant to research and publications</li> </ol>		
<b>Course Outcomes</b>	<b>CO Statement: After successful completion of the course, the student will be able to</b>	<b>Knowledge Level</b>
CO -1	measure the pH, EC and salt contents using electrodes, prepare	K1-K4

	buffering solutions to be used in experimental assays, analyze the samples through different spectroscopic procedures.					
CO -2	efficiently use electrophoretic technique to separate biomolecules; use various types of microscopes through a thorough understanding of optics and dyes involved; demonstrate the knowledge of different types of centrifuges	K1-K4				
CO -3	be proficient in collection, presentation and statistical analyses of data; proficiency to make a conclusion; and use of excel to organize data.	K1-K5				
CO -4	understand the nature and applicability of different chemicals used in microtechnique; process plant materials for microtome sectioning; and handle microtomes to take fine sections.	K1-K4				
CO -5	design unbiased experimental design and conduct experiments to test the hypothesis following the ethics and codes; and proficient in presenting the results in scientific forums and in thesis.	K1-K5				
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Genetics, Genomics and Bioinformatics</b>
<b>Course Code</b>	:	<b>PBYC23</b>
<b>Course objectives:</b>		
<ol style="list-style-type: none"> <li>1. To understand the laws of inheritance, modified mendelian ratios, gene mapping, cytoplasmic inheritance, ploidy types and population genetics.</li> <li>2. To know about the nature of mutations and its molecular mechanism, diagnosing methods, applications of mutations and homeotic mutants in plants.</li> <li>3. To introduce the modern concepts of genomics and proteomics.</li> <li>4. To know the history, introduction and scope of Bioinformatics, role of computers in biology, search engines and database management systems.</li> <li>5. To find out the biological databases, Primary nucleotide sequence databases, Sequence Alignment and Analysis, Molecular modeling and visualization tools, Phylogenetics.</li> </ol>		
	<b>CO Statement: Students will be able to</b>	<b>Knowledge Level</b>
CO -1	understand the classical and modern genetics, cytoplasmic inheritance and population genetics.	K2-K4
CO -2	analyse the molecular mechanism of mutation, detection of mutation and homeotic mutants in plants.	K1-K4
CO -3	explore the modern concept of genomics and proteomics.	K2-K4



CO -4	gain knowledge about rapidly growing field bioinformatics and its elements.					K2-K4 & K6
CO -5	know the biological databases, especially nucleic acids and protein databases.					K2-K4
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Horticulture and Plant Breeding</b>				
<b>Course Code</b>	:	<b>PBYEE</b>				
<b>Course objectives:</b> Enable the students to						
<ol style="list-style-type: none"> <li>1. explore the garden types and different cultivation models</li> <li>2. learn different cultivation techniques in plant propagation and interpret its importance</li> <li>3. understand Pollination mechanism and reproduction types in plant breeding</li> <li>4. study the parents' selection and genetic consequences of hybridization</li> <li>5. transfer the different types of characters through breeding and their application</li> </ol>						
	<b>CO Statement: Students will be able to understand, gain knowledge, apply and analyse</b>					Knowledge Level
CO -1	The horticultural tools and structures for the development of agriculture					K1-K3
CO -2	the various cultivation techniques influence in the production of horticultural plants					K1-K4
CO -3	The Identification of barriers in self and cross pollination in plant breeding					K1-K3
CO -4	The comparative statement of selection and failure of hybridization and their role in clonal propagation					K1-K4
CO -5	On transfer of various characters into breeds and their application in hybrid production					K1-K4
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Plant Physiology and Biochemistry</b>				
----------------------------	---	--	--	--	--	--

<b>Course Code</b>	:	<b>PBYC31</b>				
<b>Course objectives:</b> Enable the students to						
<ol style="list-style-type: none"> <li>1. learn the energy flow in biological system and the enzyme catalysis</li> <li>2. understand water and nutrient absorption and translocation in plants</li> <li>3. comprehend the components and processes involved in photosynthesis.</li> <li>4. know the metabolic pathways of respiration and energy flow.</li> <li>5. understand the influence of plant growth regulators on plant functions</li> </ol>						
	<b>CO Statement: After successful completion of the course, the student will be able to</b>	<b>Knowledge Level</b>				
CO -1	demonstrate knowledge in fundamental processes of energy flow through redox reactions, enzyme catalysis and the principle behind the enzyme action.	K1-K4				
CO -2	explain the theory behind water absorption and transportation through xylem; and translocation of food through phloem.	K1-K4				
CO -3	appreciate the potential and metabolic pathways of plants to synthesize their food through photosynthesis and way in which the energy is channeled towards anabolic processes.	K1-K4				
CO -4	realize the importance of respiration in sustaining the energy production; and the way nitrogen and sulphur are assimilated in plants	K1-K4				
CO -5	understand the role of plant hormones in plant growth and development and exploit such phenomena to promote plant growth and production	K1-K5				
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Plant Physiology and Biochemistry</b>
<b>Course Code</b>	:	<b>PBYL31</b>
<b>Course objectives:</b> Enable the students to		
<ol style="list-style-type: none"> <li>1. to learn specific enzyme assays and determine the reaction rate and Km values</li> <li>2. to gain proficiency in extracting the chlorophyll and other pigments from leaves and documenting the absorption spectrum</li> <li>3. to learn the methodologies behind the extraction and analysis of protein through electrophoresis</li> <li>4. perform seed viability tests; and enzyme assay to correlate the respiration and peroxidase activity</li> <li>5. observe the effect of plant hormones on plant growth and development; and determine auxin concentration in plant tissue</li> </ol>		

	<b>CO Statement: After successful completion of the course, the student will be able to</b>					Knowledge Level
CO -1	assay specific plant enzymes and determine the effect of time and substrate concentration on reaction rates of enzymes					K1-K4
CO -2	isolate chlorophyll and other accessory plant pigments, quantify and correlate with the rate of photosynthesis					K1-K4
CO -3	extract the protein from chloroplast and seeds, quantify them and analyze them using electrophoresis					K1-K4
CO -4	determine the viability of seeds through simple chemical tests and demonstrate the respiration through peroxidase activity					K1-K5
CO -5	Devise application strategies to exploit the plant hormones to improve the plant growth and yield and attempt commercial developments of formulations of plant hormones.					K1-K6
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Angiosperm Taxonomy</b>	
<b>Course Code</b>	:	<b>PBYC32</b>	
<b>Course objectives:</b>			
<ol style="list-style-type: none"> <li>1. To acquire knowledge on morphology of range of structures in angiosperms.</li> <li>2. To get an understanding of the history and theories underlying different approaches to plant taxonomy and classification; and, to widen knowledge and fluency with scientific names and the rules governing their application.</li> <li>3. To become familiar with classical and modern approaches in angiosperm classification</li> <li>4. To understand general and unique characters of major taxa and their systematic positions; and to build up commendable knowledge on selected important plant families.</li> <li>5. To become familiar with economically important plants, their parts and uses.</li> </ol>			
	<b>CO Statement: Students will be able to remember, understand, apply and analyse</b>		Knowledge Level
CO -1	Morphological structures of vegetative and reproductive plant organs.		K1-K4
CO -2	Evolution of angiosperms; fundamental and guiding principles of nomenclature; range of taxonomical literatures.		K1-K4
CO -3	Classical and modern approaches in the classification of angiosperms.		K1-K4
CO -4	General and diagnostics vegetative and reproductive characters of families.		K1-K4
CO -5	Economic importance of whole plant, vegetative parts, flowers,		K1-K3

	seeds and fruits.					
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Ecology and Conservation Biology</b>				
<b>Course Code</b>	:	<b>PBYC33</b>				
<b>Course objectives:</b> To enable the students						
<ol style="list-style-type: none"> <li>1. To understand the climate, soil and its fertility, physiographic and biotic factors.</li> <li>2. To learn the characteristics of population and the importance of ecological indicators and endemic plants.</li> <li>3. To acquire the knowledge of community ecology and succession.</li> <li>4. To know the structure, components and functions of different ecosystems, flow of energy and minerals and various biogeographical zones of India.</li> <li>5. To emphasize the importance of conserving rare plants.</li> </ol>						
	<b>CO Statement: Students will be able to</b>					Knowledge Level
CO -1	The climatic, edaphic, physiographic and biotic factors.					K1-K3
CO -2	The characteristics of population, ecological indicators and endemism.					K1-K3
CO -3	The ecological succession and community ecology.					K1-K3
CO -4	The structure, components and functions of different ecosystems and biogeography of India.					K1-K3
CO -5	The importance of biodiversity conservation and methods.					K1-K3
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>Phytochemistry and Traditional Medicine</b>				
<b>Course Code</b>	:	<b>PBYC41</b>				
<b>Course objectives:</b> To enable the students to						
<ol style="list-style-type: none"> <li>1. have a comprehensive knowledge of secondary metabolites of plants and their ecological role.</li> <li>2. learn the isolation and quantification of phytochemicals.</li> <li>3. understand the biosynthetic pathways and applications of phytochemicals.</li> <li>4. comprehend the history of herbalism and ethnobotany.</li> <li>5. acquire the knowledge of traditional system of medicine.</li> </ol>						

	<b>CO Statement: Students will be able to learn</b>	Knowledge Level
CO -1	classification, characteristic and comparative features of secondary metabolites from plants.	K1-K3
CO -2	isolation and quantification of phytochemicals from plants.	K1-K3
CO -3	biosynthetic pathways of secondary compounds and application of phytochemicals.	K1-K3
CO -4	herbalism and ethnobotanical studies.	K1-K3
CO -5	traditional system of medicines viz. Ayurveda, Siddha, Unani, Tibetan, Yoga and Naturopathy.	K1-K3

<b>Title of the Course</b>	:	<b>Plant Biotechnology</b>
<b>Course Code</b>	:	<b>PBYC42</b>
<p><b>Course Objectives:</b> To teach students on</p> <ol style="list-style-type: none"> <li>1. History, basic principles and concepts of plant cell, tissue, organ culture and organogenesis</li> <li>2. Techniques of micropropagation, synthetic seed production and conservation of RED listed and economically important plants</li> <li>3. Protoplast isolation, culture and somatic hybridization and conservation of germplasm by cryopreservation</li> <li>4. Mechanism of recombination, gene cloning and molecular marker technology for understanding genetic diversity</li> <li>5. Methods of producing transgenic plants, advances in genetic engineering and production of hybrid seeds</li> </ol>		
	<b>Course Outcome Statement: Students would have</b>	Knowledge Level
CO -1	Developed skills for medium composition, initiating plant cell, tissue and organ culture, production and extraction of secondary metabolites	K1-K6
CO -2	Gained knowledge on various methods of producing large number of plants by <i>in vitro</i> for conservation and horticultural purposes	K1-K5
CO -3	Mastered the procedures for protoplast isolation, culture and somatic hybridization and conservation of germplasm by cryopreservation	K1-K5
CO -4	Learnt to produce and create different mechanisms for recombination, gene cloning for producing recombinants and molecular marker technology for assessing genetic diversity	K1-K5

CO -5	Understood to generate transgenic plants, be acquainted with advances in genetic engineering and production of hybrid seeds					K1-K6
<b>Knowledge Level</b>	<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
	Remember	Understand	Apply	Analyze	Evaluate	Create

<b>Title of the Course</b>	:	<b>PBYI41- Field Study</b>
<b>Course objectives:</b>		
<ol style="list-style-type: none"> <li>1. to observe the plants in their habitat and collect specimens for further study in the laboratory.</li> <li>2. To learn the methodologies of recording the observations on plants habit and habitats</li> <li>3. To understand the interaction of plants with other organisms of forests and engage in discussion with tribal peoples</li> <li>4. visit relevant industries to understand how the theoretical learning is being put into practice</li> <li>5. to translate the recorded information in the tour diary into a technical report</li> </ol>		
	<b>CO Statement: After successful completion of the field trip, the student will be able to</b>	Knowledge Level
CO -1	demonstrate the knowledge of sample collection from various ecosystems and the availability of specific plants in specific locations	K1-K4
CO -2	technically document the information on plants and make them a source of information for future reference	K1-K4
CO -3	critically analyze the plant ecosystems and their co-existence with other organisms and the interaction with both biotic and abiotic factors in the field.	K1-K4
CO -4	to realize the application potential of the knowledge acquired in the industrial sectors	K1-K4
CO -5	write technical report on a field trip translating the observations made during the trip	K1-K3