Programme: M. Sc. Botany

SEMESTER I			
Core I	**Plant Diversity I (Algae, Bryophyte, Fungi and Lichen)**		
Course Code:21PBOC11	**Hrs/week: 6**	**Hrs/Semester: 90**	**Credit: 4**

Course Outcome

CO. NO	Upon completion of this course, students will beable to	PSO addressed	CL
CO-1	illustrate the distinguishing features of algae, bryophytes, fungi and lichens and appreciate their uniqueness	1, 2	Un, Re
CO-2	compare the status of cryptogams in evolution of advanced plant groups	1, 2	An
CO-3	illustrate the basic skills and critique the role of algae, fungi, lichen and bryophytes in their everyday life and environment	5, 6	Ap, Ev
CO-4	implement the practical knowledge to identify a particular group from a mixed group in the laboratory and in the field	6	Ap
CO-5	indicate the adaptive features of cryptogams to their habitats	1, 2, 7	Un
CO-6	relate the phylogenetic relationship between the different plant groups	1, 2	Un

SEMESTER I			
Core II	**Plant Microbe Interaction**		
Course Code: 21PBOC12	**Hrs/week: 6**	**Hrs/Semester: 90**	**Credits: 4**

Course Outcomes

CO.No	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	perform the techniques of isolation, characterization and measure the growth of bacteria	4	Re
CO-2	differentiate the mode of action of antibiotics	3	An
CO-3	outline the stages of disease pyramids and disease cycle.	2	An
CO-4	know about the enzymes involved in plant diseases	3	Re
CO-5	understand the basic principles related to plant diseases.	2	Un
CO-6	differentiate the general symptoms of bacterial disease, viral diseases and fungal disease	6	Un

Semester I			
Core III	**Bioinstrumentation and Research Methods**		
Course Code: 21PBOC13	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credits: 4**

Course Outcome

CO.No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	acquaint with different tools and techniques essential for research work	6	Cr
CO-2	understand the fundamentals of statistics and statistical analysis	4	Un
CO-3	do statistical analysis and communicate the results of statistical analyses accurately and effectively	4	Ap
CO-4	examine the basic framework of research process and able to learn how to address research problem and what is to be done to solve it.	6	An
CO-5	communicate the research findings to the scientific forums	6	Cr
CO-6	develop an understanding of the ethical dimensions of conducting applied research	7	An

Semester I			
Core IV	**Phytochemistry and Pharmacognosy**		
Course Code: 21PBOC14	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credits: 4**

Course Outcome

CO. No.	Upon completion of this course, students will be able to	PSO's addressed	CL
CO-1	confirm the promising role of the phyto constituents as cytotoxicity and substantiate them for the treatment offatal diseases	8	Re
CO-2	understand the importance of secondary metabolites and relate them in treating the ailments	3	Un
CO-3	identify and categorize medicinal potential of herbs based on their chemical constituents and therapeutic applications	3	Ap
CO-4	extract essential oils from natural resources and utilize them effectively as pharamaceuticals and cosmeticals	7,8	Aa
CO-5	evaluate the purity of the drugs and able to detect adulterations and substitutions	2,4	Ev
CO-6	screen and elucidate various pharmacologically important phyto constituents to ascertain its medical quality	4	Ev

SEMESTER II			
Core V	**Plant Diversity II (Pteridophytes, Gymnosperms and Paleobotany)**		
Course Code: 21PBOC21	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credit: 4**

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	appreciate the uniqueness and distinguish between diverse groups of Pteridophytes and Gymnosperms using their characteristic features	1,2	Un, An
CO-2	discuss different lifecycle patterns in different groups	1,2	An
CO-3	know the basic skills and techniques in micro preparation and formulate methods to identify different groups	1,6	Ap
CO-4	know the evolutionary significance of Pteridophyte	1,2	Un
CO-5	compare and contrast the origin and evolution of steles, foliage, seed and seedless plants.	4,8	Ev
CO-6	review critically the biology, ecology of fossils and methods of fossilization.	1,7	Un

SEMESTER II			
Core VII	**Developmental Botany**		
Course Code: 21PBOC23	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credit: 4**

Course Outcome

CO. No	Upon completion of this course ,students will be able to	PSO addressed	CL
CO-1	understand the overview of essential aspects of development and know how embryo arises and the nature of signals that guide complex patterns of growth anddifferentiation in the embryo	3, 4	Un
CO-2	explore and illustrate how the molecular and genetic approaches provide an insight into the mechanism that translate cues into organized pattern growth and development	4	Re, Un
CO-3	role of shoot and root apical meristem in vegetative growth and development	3	Re, Un
CO-4	know the biochemical and physiological changes associated with the development of sex organs, fertilization events and fruit development	4	Un, Ap
CO-5	know how the intrinsic programmes of development coupled to external influences such as nutrient levels, energy inputs and environmental signals.	4	Un
CO-6	acquire hands on training experience related to thecourse.	4	Re

SEMESTER – II			
Core VIII	**Genetics and Bioinformatics**		
Course Code:21PBOC24	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Course Outcome

CO. No.	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	associate the physical basis of heredity and the mode of inheritance of a character	2	Un
CO-2	predict the unknown phenotype and genotype in a partially known pedigree	4	Ap
CO-3	understand various chromosomal aberrations and various chromosome banding techniques,	1, 2	An, Un
CO-4	comprehend the operations in population genetics and develop skill in map a gene and measure the distance between two genes	2, 4	Un, Ap
CO-5	predict gene of unknown sequences, similarity between sequences, protein structure, phylogenetic relationshipsbetween large groups using genomic data	1, 4	An, Ap
CO-6	learn barcoding techniques and sequence submission	1,2	An, Un

SEMESTER III			
Core IX	**Biochemistry and Biophysics**		
Course Code: 21PBOC31	**Hrs/week: 6**	**Hrs/Semester: 90**	**Credits:4**

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	study the polymeric biomolecules and their monomeric building blocks	1,2	Re
CO-2	illustrate that living organisms and biological system interact via molecular connection	1,3	Re
CO-3	able to realise the importance of structural configuration of biomolecules and their atomic rearrangement with respect to their functions	1,6	Re
CO-4	outline enzyme groups and nomenclature that be able to explain the specificity of enzyme's role and also detect the source, and chemistry of vitamins and symptoms specific to their deficiency	2,3	An
CO-5	set up and operate variety of experiments and analyse data accompanied by problem solving and recording.	3,4	Ap
CO-6	draw electromagnetic spectrum and understand the properties of light, enabling to explain that light energy is needed by plant and that is transformed in biochemical system as governed by the laws of thermodynamics	3,7	Ap, Cr

SEMESTER III			
Core X	**Taxonomy of Angiosperms**		
Course Code:21PBOC32	**Hrs/week:6**	**Hrs/Semester: 90**	**Credit:4**

Course Outcome

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the rules of botanical nomenclature and taxonomical hierarchy that enable to organize the plant based on the hierarchical system	1	Ap
CO-2	apply scientific literature for identifying and grouping of underrepresented plants in the taxonomic literature and gain hands on working experience in describing the floristic feature of the plants of specified families and make sketches of that.	4, 1	Re, An
CO-3	outline different systems of classification and recall the contribution of taxonomist/naturalist in plant systematic	1	Un
CO-4	compare the traditional and modern system of classification and report its merits and demerits and recognize how the role of cytology, embryology , phytochemistry and molecular biology of plants help to authenticate the identity of plants	1, 3	Ap
CO-5	realize the importance of taxonomical literature (flora, monograph, botanical gardens, herbarium and government organization) and utilize them for plant identification and conservation.	2	Un
CO-6	apply effectively the traditional and modern tool (Keys, interactive keys, e-flora, digital herbarium) to develop skill in plant identification	4	Un

SEMESTER - III			
Core XI	**Molecular Biology and Genetic Engineering**		
Course Code: 21PBOC33	**Hrs/week: 5**	**Hrs/Semester: 75**	**Credits: 4**

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	discuss the chemistry of genetic material and details of its replication at molecular level and analyze how errors during replication are repaired	1	Un, An
CO-2	infer complexity of gene expression in eukaryotes over prokaryotes and compare gene regulation mechanisms at various levels by which they can learn how it controls growth and development of an organism	2, 4	Un, An
CO-3	illustrate the principles of genetic engineering and investigate the basic steps of gene cloning	2	Un, An
CO-4	indicate the role of enzymes and vectors responsible for gene manipulation, transformation and genetic engineering	1	Un
CO-5	investigate and critique the different types of gene transfer methods employed in gene cloning process	2, 3	An, Ev
CO-6	implement the advanced techniques in genetic engineering, present the different strategies of recombinant DNA technology and resolve the problems encountered	7	Ap

SEMESTER - IV			
Core: XIII	**Plant Physiology**		
Course Code: 21PBOC41	**Hrs/week: 6**	**Hrs/Semester : 90**	**Credits: 5**

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the effect of the soil-plant-water continuum (SPWC) and assess the need of mineral nutrients and symptoms specific to nutrient deficiency.	2, 6	Un
CO-2	discuss how root structure and functions influence the transfer of inorganic nutrients from the soil into the plants,	3	Un
CO-3	analyse the mechanism of assimilation of inorganic molecules into organic molecular components and lightenhanced photochemical reactions that culminatesin the synthesis of ATP and NADPH and fixation of carbon dioxide into organic compounds	3	Un
CO-4	describe respiration with its associated carbon metabolism and releasing of energy stored in chemical bonds in a controlled manner for cellular use	3	Re
CO-5	review systematically how plant's manage physiologically with respect to environmental stress and remark on the hormone controlled and light mediated morphogenetic events in plants.	3	Cr
CO-6	design and conduct scientific experiments and analyze the data critically	6	Cr

SEMESTER IV			
Core XV	**Plant Biotechnology**		
Course Code: 21PBOC43	**Hrs/week: 4**	**Hrs/Semester: 60**	**Credits:4**

Course Outcome

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	comprehend the basic principal of in-vitro tissue culture and develop skills in methods of tissue culture.	3	Re, Un
CO - 2	substantiate tissue culture is the viable option for the conservation of endangered plants	4	Re
CO - 3	grasp the techniques of mass cultivation of biofertilizer and defend biofertilizer a boon to sustainable agriculture	3	Un
CO - 4	categories different methods of synthesis of nanoparticles and understand the wide range of application of nanotechnology.	3	Un
CO - 5	describe what is plant molecular farming and highlight that transgenic plants are bioreactor for production of quality protein and other metabolites valuable to medicine and industries?	4	Ap
CO - 6	utilize transferable skills obtained through the course for the professional accomplishment	1	Re

SEMESTER – IV			
Core Elective	**Nanobiotechnology**		
Course Code: 21PBOE42	**Hrs/Week: 4**	**Hrs/Semester: 60**	**Credits: 4**

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO's Addressed	CL
CO-1	understand the fundamental principles of nanotechnology and types of nano particle	3	Un
CO-2	apply engineering and physics concepts to the nano-scale and non-continuum domain.	4	Cr
CO-3	understand the wide range of applications of nanotechnology and its interdisciplinary aspect	2	Re
CO-4	apply and transfer interdisciplinary systems engineering approaches to the field of bio- and nanotechnology projects	3	Re
CO-5	practice and explain state-of-the-art characterization methods for nanomaterials, understanding and critiquing nanomaterial safety and handling methods required during characterization and its applications in the various field like bioengineering, biomedicine and agricultural/environmental issues	4	An
CO-6	correlate the impact of nanotechnology and nanoscience in a global, economic, environmental, and societal context and identify career paths at the interface of nanotechnology, biology, environmental and agricultural engineering and medicine	6, 7	En

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