



P.P.N. (P.G.) College, Kanpur

96/12 Mahatma Gandhi Marg, Kanpur -208001

•Telefax: (0512)2361924 •Website: www.ppncollege.org •

•email:ppncollegekanpur@gmail.com •

Date : 08/05/2023

PG-BOTANY

COURSE OUTCOMES (COs)

DEGREE OF MASTER OF SCIENCE-PREVIOUS

		TITLE	CODE	T/P/R	TYPE	CREDIT		
FIRST YEAR	SEMESTER - I	Diversity of Microbes and Fungi	B040701T	THEORY	CORE	04		
		CO 1	Understand the occurrence, general characters, types, reproduction and life cycles of the major microbial groups and their role in food, clinical and industrial microbiology.					
		CO 2	Apply practical skills in basic microbiological techniques.					
		CO 3	Evaluate the classificatory approaches and advances in bacterial and viral taxonomies.					
		CO 4	Understand the general characters, structure, nutrition, reproduction and the principles on classifications of Fungi.					
		CO 5	Study fungal associations and fungal physiology.					
		CO 6	Understand pathological importance of fungi.					
		CO 7	Understand the occurrence, general characters, types, reproduction and life cycles of the major fungal groups.					
		CO 8	Economic importance of fungi in medicine, agriculture (Biopesticide and biofertilizer), food (Mushrooms)					
				Diversity of Algae and Bryophytes	B040702T	THEORY	CORE	04
		CO 1	Understand the contributions of famous Indian phycologists and centers of Algal Research in India.					
		CO 2	Understand the classificatory approaches and advances in algal taxonomy.					
		CO 3	Understand the general features of algae and its different groups and their representative genera.					
		CO 4	Study their ecological and economic importance.					
		CO 5	Understand the origin, diversity and evolution of Bryophytes					
		CO 6	Understand the different classificatory systems of Bryophytes					
		CO 7	Understand the general characters and the structure of the plant body of the types of Bryophytes mentioned in the syllabus.					
		CO 8	Study the ecological and economic Importance of bryophytes that will help to understand their role in ecosystem functioning.					
				Diversity of Pteridophytes and Gymnosperms	B040703T	THEORY	CORE	04
		CO 1	To know earlier plants, their vegetative and reproductive structures and their importance.					
		CO 2	To acquaint the students about the morphology, biology and importance of Pteridophytes & Gymnosperms.					
		CO 3	To demonstrate sufficient knowledge of the concept of the Progymnosperms plants.					
		CO 4	Apply the medicinal and economic knowledge of Pteridophytes and Gymnosperms for the benefit of human welfare.					
		CO 5	To differentiate between the characteristics of Pteridophytes & Gymnosperms.					
		CO 6	Acquaint with evolution of stele in Pteridophytes					
		CO 7	To differentiate between male and female reproductive organs and relate their structure and function to the production of new plants.					
		CO 8	To gain comprehensive, in-depth, and definitive knowledge & perspectives about <i>Cryptomeria</i> , <i>Araucaria</i> , <i>Podocarpus</i> , <i>Thuja</i> , <i>Taxus</i> and <i>Gnetum</i> by their monographic study					
		CO 7	To be able to trace the evolution from fossil plants.					
		Diversity of Plant Ecology	B040704T	THEORY	CORE	04		
CO 1	Understand the Ecosystem: Types, structure and functions of ecosystem (pond ecosystem). Determine minimal quadrat size and understand herbaceous vegetation in the college campus by species area curve method and elaborate plant population and community Ecology							
CO 2	Discuss productivity of ecosystem-Primary, Secondary and Net productivity and productivity							



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	measurement.					
CO 3	Understand Plant succession-Hydrosere and Xerosere					
CO 4	Identify the hotspots, phytogeographical regions and distribution of endemic plants in the map of India.					
CO 5	Explain Biodiversity, causes and conservation (In-situ and ex-situ methods) and various methods in Seed banks and understand concept of sustainable development & sustainability indicator					
CO 6	Discuss importance of nurturing biodiversity.					
CO 7	To know about Climate change, Greenhouse gases, their sources, trends and role, Ozone layer and its depletion (Global warming, Sea level rise, UV radiation) acid rain, Bioindicator and biomarkers of environmental health.					
CO 8	Understand the environmental pollution, kinds, and sources, effects on plants causes and consequences and control.					
General Lab		B040705P	PRACTICAL	CORE	04	
CO 1	Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory.					
CO 2	Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes.					
CO 3	Practical skills in the field and laboratory experiments in Microbiology & Pathology.					
CO 4	Learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations					
CO 5	Examine the vegetative and reproductive structures and predict the position of specimens in classification.					
CO 6	Identify, name and list the specimens of Pteridophytes and Gymnosperms from a given area.					
CO 7	Classify the preserved and live specimens of Pteridophytes and Gymnosperms and organize them in different orders.					
CO 8	Compare the living specimens of different orders of Pteridophytes and Gymnosperms and relate them to each other.					
CO 9	Understand the vegetative organization in community. Students will get to know about how changes take place during ecological succession.					
CO10	Develop knowledge about structure and function of ecosystem and also understand about biogeochemical cycle in environment and its role.					
CO11	Students will understand the effect of air, water and soil pollution in environment. They will also develop knowledge about greenhouse gases its sources and role.					
CO12	Students will get knowledge about invasive species of plant. They will get to know about how ecological management takes place.					
CO13	Can start own enterprise on microbial products.					
SEMESTER -II	Taxonomy of Angiosperms and Biosystematics		B04080 1T	THEORY	CORE	04
	CO 1	Outline the concepts of Taxonomy with Identification, nomenclature and International code of botanical nomenclature, rules and recommendations, various classification of plants using additional OE resources available in the internet using modern ICT tools and flora of college campus				
	CO 2	Understand the Bentham and Hooker's System of Classification, Takhtajan's classification system.				
	CO 3	Discuss about the families of dicots and monocots and technical description of various plants.				
	CO 4	To study Herbarium and Botanical Gardens.				
	CO 5	Understand Biosystematics and experimental taxonomy, Numerical taxonomy, Chemotaxonomy and Palynotaxonomy.				
	CO 6	Understand Embryology in relation to plant taxonomy.				
	CO 7	Understand molecular approach to plant taxonomy, Angiosperm phylogeny groups (APG), DNA barcoding and its practical application in Angiosperm taxonomy				
	Morphology, Anatomy and Embryology of Angiosperms		B040 802T	THEORY	CORE	04
	CO 1	To provide basic knowledge of plant internal architecture and cellular composition and reproduction.				
	CO 2	This will help them to understand how different plant tissue structures evolve and modify their functions with respect to their environment.				
	CO 3	Knowledge regarding anatomy equipped the students to identify different types of tissues and make them able to correlate their physiology in a better away.				



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CO 4	Understand the morphological characteristics of flower.
CO 5	Study the fundamental concepts of shoot, leaf and root development.
CO 6	Understand various stages of development of plants.
CO 7	Understand the developmental biology of male and female gametophyte, pollen-pistil interaction.
CO 8	Study the basic idea of embryogenesis and seed development process, apomixes and polyembryony.
Cytogenetics & Basic Molecular Biology	
	B040803T
	THEORY
	CORE
	04
CO 1	Apply the concepts of Mendelian genetics to solve problems on linkage, crossing over and gene mapping.
CO 2	Analyze human pedigree and apply the principles of population genetics to work out problems on genotype frequency and Hardy-Weinberg equilibrium. Understand the Chromosomal aberrations and their role in genome evolution with special reference to crop plants.
CO 3	Understand the fundamental molecular process, structure of the chromosome.
CO 4	Analyze the tools and techniques used in genetic engineering
CO 5	Evaluate the methods and applications of recombinant DNA technology.
CO 6	Understand the blotting techniques, DNA sequencing, and genetic engineering of plants.
Plant Breeding & Elementary Biostatistics	
	B040805T
	THEORY
	ELECTIVE
	04
CO 1	Understand modern breeding methods in improving agricultural crop varieties.
CO 2	Understand the process of cell cycle its regulation and the mechanism of apoptosis.
CO 3	Will be able to effectively conduct research.
CO 4	Will be able to read and evaluate journal articles.
CO 5	Develop critical thinking and analytic skills
General Lab	
	B040806P
	PRACTICAL
	CORE
	04
CO 1	The students will be made aware of the group of plants that have given rise to land habit and the Flowering plants. Through field study they will be able to see these plants grow in nature and become familiar with the biodiversity.
CO 2	Students would learn to create their small digital reports where they can capture the zoomed in and zoomed out pictures as well as videos in case they are able to find some rare structure or phenomenon related to these plants.
CO 3	Develop an understanding by observation and table study of representative members of phylogenetically important groups to learn the process of evolution in a broad sense.
CO 4	Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding plant diversity, economic values & taxonomy of lower groups of plants
CO 5	Understand the composition, modifications, internal structure & architecture of flowering plants for becoming a Botanist.
CO 6	Identify different stages of mitosis and meiosis.
CO 7	Deconstruct the different concepts of genetics and solve problems based on them.
CO 8	Methods of breeding self- and cross-pollinating plants and Understand the significance of different plant breeding systems
CO 9	Learn crop improvement methods
CO 10	Learn and apply the importance of biostatistics in research
CO 11	Get knowledge about statistical softwares and their application in analysis of statistical data.
RESEARCH PROJECT	
	B040807R
	PROJECT
	PROGRESSIVE
	04
CO 1	Identify the topic of research, its objectives and state its importance.
CO 2	Articulate the information to write a review of literature.



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CO 3	Prepare the reagents and implement the experiment procedure with precision and accuracy.
CO 4	Standardize the protocols of the experiments, test the hypothesis and compare the work with relevant national and international research papers.
CO 5	Analyze the data statistically using tests of significance.
CO 6	Design, perform the experiments, compile the observations, draw conclusions, interpret the results, write a report and integrate the work in form of presentation.

DEGREE OF MASTER OF SCIENCE-FINAL

SECOND YEAR	SEMESTER - III	Plant Physiology and Biochemistry		B040901T	THEORY	CORE	04
		CO 1	Understand Plant physiology, a sub discipline of Botany concerned with functional aspects of plants.				
		CO 2	Understand the transport phenomenon of water and Transpiration and water relations to plant cell.				
		CO 3	Remember all internal metabolic activities of plants and understand Photosynthesis & Respiration process with physiological and ecological consideration.				
		CO 4	Explain the growth and development of plants, concept of plant growth regulators and phytohormones their physiological effects and mechanisms of action.				
		CO 5	Understand the process of photoperiodism and vernalization and foreign concept.				
		CO 6	To understand enzymes and its classification, physiochemical nature, enzyme kinetics, mechanism of action and regulation, Michaelis-Menten equation and its significance				
		CO 7	To understand the structure of lipid and its types and biological significance.				
		Plant Biotechnological and Molecular Techniques		B040902T	THEORY	CORE	04
		CO 1	To introduce students to the principles, practices and applications of plant biotechnology, plant tissue culture, plant genomics, genetic transformation and molecular breeding of plants.				
		CO 2	To explain genome organization in higher organisms and discuss about methods of gene transfer and selection of transgenics				
		CO 3	Discuss about restriction endonuclease, cloning vectors, gene cloning and understand the steps involved in recombinant DNA technology.				
		CO 4	To explain the construction of DNA & c DNA library and their applications and various application of Polymerase chain reaction (PCR).				
		CO 5	To get insight in applications of recombinant DNA technology and plant genetic engineering in agriculture, production of therapeutic proteins and secondary metabolites, forensic science, commercial production of fuels, microbial enzymes, Bioremediation & Environment.				
		CO 6	To explain the various hybridization techniques for identification of DNA, protein, and RNA.				
		Biodiversity and Conservation		B040905T	THEORY	ELECTIVE	04
		CO 1	Understand the biogeography and initiatives for biodiversity conservation.				
		CO 2	Understand the various uses of plants; biodiversity status, loss and management strategies.				
		CO 3	It will develop a critical knowledge in evolving strategies for sustainable natural resource management and biodiversity conservation.				
		CO 4	Get a deep knowledge on biodiversity richness in global scale and biogeography of India.				
		CO 5	Assess the value of biodiversity wealth of our Nation.				
		CO 6	Gain knowledge of effective and scientific sustainable use of resources and conservation of biodiversity.				
		CO 4	Analyze various threats to our biodiversity and able to suggest measures for conservation Strategies.				
		CO 5	Learn about wetland conservation and important RAMSAR sites.				
		Medicinal and Aromatic Plants		B040906T	THEORY	ELECTIVE	04
		CO 1	Understand about the uses of plants as medicine.				
		CO 2	Understand the diversity and distribution of medicinal plants.				



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	CO 3	Understand phytochemical analysis to know bioactive molecules and therapeutic values related to medicinally important plants and economic products by the plants.				
	CO 4	Study the techniques/methods for the sustainable utilization of the medicinal plants.				
	CO 5	Know about the importance of plants in daily life, about the traditional medicines and its relevance in modern times.				
	CO 6	Learn about nutraceutical and medicinal foods.				
	CO 7	Gain knowledge about commercial cultivation of medicinal and aromatic plants.				
	CO 8	Get acquainted with the concept of bioprospecting, biopiracy and traditional medicinal knowledge.				
		General Lab	B040907P	PRACTICAL	CORE	04
	CO 1	Student can extract chloroplast pigment from leaves.				
	CO 2	Estimate the enzyme activities and compare the effect of different factors on enzyme activities.				
	CO 3	Student can identify structure of stomata while peeling epidermis leaves of Tradescantia.				
	CO 4	Know and authenticate the physiological processes undergoing in plants along with their metabolism				
	CO 5	Identify Mineral deficiencies based on visual symptoms				
	CO 6	Understand and develop skill for conducting molecular experiments for genetic engineering.				
	CO 7	Describe the procedures of basic biotechnology experiments.				
CO 8	Differentiate the plant tissue culture techniques.					
CO 9	Description of community structure by using the quadrates.					
CO 10	Identification of locally available Medicinal and aromatic plants					
CO 11	Learn extraction of essential oils of aromatic plants.					
CO 12	Identification of locally available Medicinal and aromatic plants					
CO 13	Herbarium preparation of Ethnobotanical, medicinal and aromatic plants.					
CO 14	Commercial cultivation of medicinal and aromatic plants.					
SEMESTER - IV		Advanced Plant Pathology	B041002T	THEORY	ELECTIVE	04
	CO 1	General characteristics of plant pathogenic organisms including fungi				
	CO 2	Study of interaction between plant and pathogen in relation to the environment and mechanism of disease development by pathogens.				
	CO 3	Understand the genetics of host parasite interaction.				
	CO 4	Understand the various enzymes and toxins involved in disease development.				
	CO 5	Study of various important plant diseases, disease cycle and control measures.				
	CO 6	To Understand roles the microorganism to cause disease in plant, pathogenesis and epidemiology.				
	CO 7	Identified the disease based on symptoms and applied the management strategies for the control of plant disease				
	CO 8	Methods to identify pathogens, and development of tools for diagnosis.				
CO 9	Processes leading to plant disease epidemics and their evaluation.					



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CO 10	Management and integrated control of plant diseases.				
Advanced Phycology		B041003T	THEORY	ELECTIVE	04
CO 1	Understand the contributions of famous Indian phycologists and centers of Algal Research in India.				
CO 2	Understand the classificatory approaches and advances in algal taxonomy.				
CO 3	Understand the general features of algae and its different groups and their representative genera.				
CO 4	Study their ecological and economic importance.				
CO 5	Understand the vital role in biology how they are an incredibly important part of many ecosystems.				
CO 6	Understand the important alga as food ingredients, fertilizers, thickeners, dyes, pharmaceuticals, fuels, pollution controls, nutritional supplements, sewage treatments, and animal feed.				
CO 7	They can develop their critical thinking in using the modern day requirement from the various algae				
Environmental Sciences		B041004T	THEORY	ELECTIVE	04
CO 1	Gain knowledge about environment and ecosystem.				
CO 2	Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.				
CO 3	Gain knowledge about the conservation of biodiversity and its importance.				
CO 4	Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.				
CO 5	Students will learn about increase in population growth and its impact on environment				
CO 6	Develop in depth knowledge about estimation of various Water Quality Parameters, Measurement of soil parameters.				
CO 7	Students will be able to Analyses Impact of Atmospheric Circulation on World Climate and Influence of Meteorological Parameters & Atmospheric Stability in shaping of Climate.				
CO 8	Students will be able to Evaluate the role of Remedial Measures in Combating Global Warming and Climate Change and Evaluate Various Policies related to Climate Change mitigation Strategies and Create a knowledge base for Global and National Action				
CO 9	Students will Analyses the role of Ozone Depleting Substances in Ozone layer Depletion and efforts for mitigation of Ozone hole Problem.				
Conservation and Restoration Ecology		B041007T	THEORY	ELECTIVE	04
CO 1	Explain and apply the key principles underpinning ecological restoration				
CO 2	Understand biodiversity status, loss and management strategies.				
CO 3	Understand the biogeography and initiatives for biodiversity conservation.				
CO 4	Describe and interpret environmental information obtained from the field and other scientific resources.				
CO 5	Assess the condition of, and threats to, an ecosystem though fieldwork and desktop activities				
CO 6	Identify and describe appropriate restoration goals and evaluation strategies				
CO 7	Design and explain appropriate restoration strategies and techniques to address specific problems eg. re-vegetation, weed control				
CO 8	Understand the role of population dynamics in biodiversity conservation				
LAB-ELECTIVE PAPERS		B041011P	PRACTICAL	ELECTIVE	04
CO 1	Study and collect the specimens of plant pathology and phycology				
CO 2	Acquaintance with various laboratory equipment and their uses in plant pathology and phycology				
CO 3	Staining and identification of plant pathogenic bacteria				
CO 4	Preparation of media, isolation and Koch's postulates.				
CO 5	Staining and identification of plant pathogenic bacteria.				



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CO 6	Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.
CO 7	Acquaint the students with the complex interrelationship between organisms and environment
CO 8	strategies for sustainable natural resource management.
CO 9	Make them understand methods for studying vegetation, community pattern and processes, ecosystem functions and principles of phytogeography.
CO 10	Design appropriate restoration strategies and techniques to address specific problems related to biodiversity conservation.
Research Project	
B041012R	
PROJECT	
PROGRESSIVE	
08	
CO 1	Identify the topic of research, its objectives and state its importance.
CO 2	Articulate the information to write a review of literature
CO 3	Prepare the reagents and implement the experiment procedure with precision and accuracy.
CO 4	Standardize the protocols of the experiments, test the hypothesis and compare the work with relevant national and international research papers.
CO 5	Analyze the data statistically using tests of significance.
CO 6	Design, perform the experiments, compile the observations, draw conclusions, interpret the results, write a report and integrate the work in form of presentation.


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PRINCIPAL