

**Bhaskaracharya College of Applied Sciences  
(University of Delhi)**

Sector-2, Phase-1, Dwarka, New Delhi-110075



# ANNEXURE 20

*Avneesh*



Prof. Avneesh Mittal

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(University of Delhi)

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# Mapping of Course outcomes with Program outcomes

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## Programme Outcomes

S. No.	Programme Learning Outcomes	Details
PO1	Problem Analysis	Identify, formulate, review research literature, and analyse complex problems in the field of plant classification and systematics, evolution, ecology, development, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, and molecular biology across different forms of life. Proficiency in various analytical methods used in plant sciences.
PO2	Design and development of solutions	Design solutions for complex problems, Knowledge of plants as industrial resources and supports for human livelihoods, and expertise in using transgenic technologies for both fundamental and applied plant research.
PO3	Environment Sustainability	Understand the impact in societal and environmental contexts and demonstrate the need of sustainable development Knowledge of different plant life forms, including their morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA and transgenic technologies, along with proficiency in using bioinformatics tools, databases, and applying statistical methods to biological data.
PO4	Ethics	Apply ethical principles and commit to professional ethics
PO5	Lifelong Learning	Ability to engage in independent and lifelong learning in the broadest context

## Course Outcomes (1<sup>st</sup> Year, NEP)

Semester 1	
S.No.	Details
<b>DSC1: Plant Diversity and Evolution (UPC: 2162011101)</b>	
CO1	Foundational knowledge on the diversity of plants and microbes.
CO2	Common traits and general characteristics.
CO3	Different plant groups and their evolutionary connections
CO4	Fundamental principles and concepts of evolution that drive plant diversity.
<b>DSC2: Cell Biology: Organelles and Biomolecules (UPC: 2162011102)</b>	
CO1	This course provides students with foundational knowledge of how macromolecule properties relate to their roles in cellular activities and biological functions.
CO2	The physical and chemical makeup of organelles and their functional arrangement.
CO3	Core principles and concepts of evolution that lead to plant diversity.
<b>DSC3: Basic Laboratory and Field Skills in Plant Biology (UPC:2162011103)</b>	



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<b>CO1</b>	This course will provide fundamental knowledge and understanding of good laboratory practices, waste management, and hazard and risk awareness to maintain a safe laboratory environment.
<b>CO2</b>	Fundamentals of measurement, units, standard mathematical calculations, sampling, and data collection
<b>CO3</b>	Instrument operation and maintenance
<b>CO4</b>	Data presentation, analysis, and result interpretation.
<b>Semester 2</b>	
<b>DSC4: Microbiology and Plant Microbe Interactions (UPC: 2162011201)</b>	
<b>CO1</b>	Understanding microbes: roles and applications.
<b>CO2</b>	Understanding about modes of reproduction of Viruses, Archaeobacteria, Eubacteria.
<b>CO3</b>	Understanding interactions between plants and microorganisms
<b>DSC5: Plant Resources and Economic Botany (UPC: 2162011202)</b>	
<b>CO1</b>	This course will offer students insights into the economic significance of plants, the products derived from them, and their roles in everyday life.
<b>CO2</b>	Students will learn how to conduct micro-chemical tests to detect the presence of various components.
<b>CO3</b>	Students will examine the regional diversity of food crops and other plants, along with their ethnobotanical significance
<b>DSC6: Plant Systematics (UPC: 2162011203)</b>	
<b>CO1</b>	Familiarize with the technical terminology used in plant taxonomy.
<b>CO2</b>	Use the terminology to describe, identify, and classify flowering plants.
<b>CO3</b>	Search for and analyse taxonomic information using internet-based scientific databases and other resources.
<b>CO4</b>	Interpret and assess the concept of species and the evolutionary processes in angiosperms.
<b>CO5</b>	Understand and compare different classification systems.
<b>CO6</b>	Identify the diversity of local and regional flora.
<b>CO7</b>	Recognize the importance and practical applications of systematics in science and societal well-being.

### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)\*

(\*For courses taught in 1<sup>st</sup> Year, NEP)

Paper	Course Outcomes (CO)	Programme Outcomes				
		PO1	PO2	PO3	PO4	PO5
<b>Semester 1</b>						
<b>DSC1: Plant Diversity and Evolution (UPC: 2162011101)</b>	<b>CO1</b>	✓				
	<b>CO2</b>	✓				
	<b>CO3</b>	✓				
	<b>CO4</b>	✓		✓		
	<b>CO1</b>	✓	✓			
	<b>CO2</b>	✓	✓			



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<b>DSC2: Cell Biology: Organelles and Biomolecules (UPC: 2162011102)</b>	<b>CO3</b>	✓				
<b>DSC3: Basic Laboratory and Field Skills in Plant Biology (UPC:2162011103)</b>	<b>CO1</b>	✓			✓	✓
	<b>CO2</b>	✓	✓		✓	✓
	<b>CO3</b>	✓	✓	✓	✓	✓
	<b>CO4</b>	✓	✓		✓	✓
<b>Semester 2</b>						
<b>DSC4: Microbiology and Plant Microbe Interactions (UPC: 2162011201)</b>	<b>CO1</b>	✓				✓
	<b>CO2</b>	✓				
	<b>CO3</b>	✓				✓
<b>DSC5: Plant Resources and Economic Botany (UPC: 2162011202)</b>	<b>CO1</b>	✓			✓	✓
	<b>CO2</b>	✓				✓
	<b>CO3</b>	✓				✓
<b>DSC6: Plant Systematics (UPC: 2162011203)</b>	<b>CO1</b>	✓				
	<b>CO2</b>	✓				
	<b>CO3</b>	✓		✓		
	<b>CO4</b>	✓				
	<b>CO5</b>	✓	✓			
	<b>CO6</b>	✓				
	<b>CO7</b>	✓		✓	✓	✓

### Course Outcomes (II<sup>nd</sup> Year, NEP)

<b>Semester 3</b>	
S.No.	Details
<b>DSC7: Phycology - The World of Algae (UPC: 2162012301)</b>	
<b>CO1</b>	This course will provide students with fundamental knowledge of algae, focusing on their diversity and general characteristics.
<b>CO2</b>	Key characteristics that differentiate taxa from various families.
<b>CO3</b>	Different ecological and economic advantages that algae have to offer.
<b>DSC8: Bryophytes, Pteridophytes and Gymnosperms (UPC: 2162012302)</b>	
<b>CO1</b>	At the end of this course students will be able to identify and describe the group of plants that have given rise to land habit and the flowering plants.
<b>CO2</b>	Comprehend various phenological stages of the plants belonging to the sub-groups – bryophytes, pteridophytes and gymnosperms.
<b>DSC9: Genetics &amp; Plant Breeding (UPC: 2162012303)</b>	
<b>CO1</b>	On completion of the course the students will be able to understand the basics of Mendelian inheritance and its variations in gene interactions.



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<b>CO2</b>	Explain the concepts of linkage and crossing over, and how they are used to construct gene maps.
<b>CO3</b>	Familiarise with pedigree analysis.
<b>CO4</b>	Learn the principles of population genetics.
<b>CO5</b>	Gain knowledge about gene mutations and inherited disorders
<b>CO6</b>	Learn about various plant breeding techniques and methods
<b>DSE1: Biostatistics &amp; Bioinformatics for Plant Sciences (UPC: 2163012002)</b>	
<b>CO1</b>	Utilize various online databases and resources to access biological data.
<b>CO2</b>	Apply different methods for aligning DNA, RNA, and protein sequences, and interpret their significance.
<b>CO3</b>	Understand and apply descriptive and inferential statistical tests for interpreting experimental data.
<b>Semester 4</b>	
<b>DSC10: Mycology (UPC: 2162012401)</b>	
<b>CO1</b>	Understand fungi, lichens and pathogens of plants
<b>CO2</b>	Understand characteristics the ecological and economic significance of the fungi and lichens
<b>CO3</b>	Economic and ecological significance of studying mycology in different fields
<b>DSC11: Ecology and Conservation (UPC: 2162012402)</b>	
<b>CO1</b>	Reciprocal relationships between organisms and environment
<b>CO2</b>	Methods to study vegetation, community patterns and processes, ecosystem functions, and principles of phytogeography.
<b>CO3</b>	Evolving strategies for sustainable natural resource management and biodiversity conservation
<b>DSC12: Development al Biology of Angiosperms: Form, Anatomy &amp; Function (UPC: 2162012403)</b>	
<b>CO1</b>	Become familiar with the structure and functions of various components of plant cell.
<b>CO2</b>	Understand the process of cell growth and its regulation
<b>CO3</b>	Comprehend the structure and functions of tissues organising the various plant organs
<b>CO4</b>	Get acquainted with the reproductive processes involved in the life cycle of angiosperms
<b>CO5</b>	Be able to appreciate the interactions between the developmental pathways resulting in the differentiation of plant body
<b>CO6</b>	Recognise the importance of plant developmental biology in the improvement and conservation of plants
<b>DSE2: Industrial and Environmental Microbiology (UPC: 2163012004)</b>	
<b>CO1</b>	Role of microbiology in manufacturing of industrial products
<b>CO2</b>	Bioreactors- design, use, applications
<b>CO3</b>	Understand the rationale in medium formulation, design for microbial fermentation, sterilization of medium and environment
<b>CO4</b>	Techniques and the underlying principles in upstream and downstream processing of significant microbe mediated processes.



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<b>CO5</b>	Learn about the occurrence, abundance and distribution of environmental microorganisms; their roles and applications as well as detection methods.
<b>CO6</b>	Understand fundamentals of environment microbiology and its applications to solve environmental problems - waste water treatment and bioremediation.
<b>CO7</b>	Learn about the various methods to determine the water quality, potability etc.

### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)\*

(\*For courses taught in II<sup>nd</sup> Year, NEP)

Paper	Course Outcomes (CO)	Programme Outcomes				
		PO1	PO2	PO3	PO4	PO5
<b>Semester 3</b>						
<b>DSC7: Phycology - The World of Algae (UPC: 2162012301)</b>	<b>CO1</b>	✓		✓		
	<b>CO2</b>	✓				
	<b>CO3</b>	✓		✓		
	<b>CO4</b>	✓				✓
<b>DSC8: Bryophytes, Pteridophytes and Gymnosperms (UPC: 2162012302)</b>	<b>CO1</b>	✓				
	<b>CO2</b>	✓				
<b>DSC9: Genetics &amp; Plant Breeding (UPC: 2162012303)</b>	<b>CO1</b>	✓	✓			
	<b>CO2</b>	✓	✓	✓		
	<b>CO3</b>	✓	✓			
	<b>CO4</b>	✓	✓			
	<b>CO5</b>	✓	✓			
	<b>CO6</b>	✓	✓			
<b>DSE1: Biostatistics &amp; Bioinformatics for Plant Sciences (UPC: 2163012002)</b>	<b>CO1</b>	✓		✓		
	<b>CO2</b>	✓		✓		
	<b>CO3</b>	✓		✓		
<b>Semester 4</b>						
<b>DSC10: Mycology (UPC: 2162012401)</b>	<b>CO1</b>	✓		✓		
	<b>CO2</b>	✓				
	<b>CO3</b>	✓		✓		✓
<b>DSC11: Ecology and Conservation (UPC: 2162012402)</b>	<b>CO1</b>	✓				✓
	<b>CO2</b>	✓	✓			✓
	<b>CO3</b>	✓	✓		✓	✓
<b>DSC12: Developmental Biology of Angiosperms: Form, Anatomy &amp; Function (UPC: 2162012403)</b>	<b>CO1</b>	✓				
	<b>CO2</b>	✓	✓			
	<b>CO3</b>	✓				
	<b>CO4</b>	✓		✓		



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	CO5	✓	✓			
	CO6	✓		✓		✓
<b>DSE2: Industrial and Environmental Microbiology (UPC: 2163012004)</b>	CO1	✓	✓			✓
	CO2	✓	✓			
	CO3	✓	✓			
	CO4	✓	✓			
	CO5	✓	✓			
	CO6	✓	✓			✓
	CO7	✓	✓			✓

### Course Outcomes (III<sup>rd</sup> Year, LOCF)

Semester 5	
S.No.	Details
<b>CC11: Reproductive Biology of Angiosperms (UPC: 32161501)</b>	
CO1	Induction of flowering, molecular and genetic aspects of flower development.
CO2	Anther structure, pollen development, dispersal and pollination.
CO3	Ovule, embryo sac development and fertilization.
CO4	Endosperm development and its importance.
CO5	Alternative pathways of reproduction and their importance.
CO6	Student would be able to apply this knowledge for conservation of plants, pollinators and fruit development.
<b>CC12: Plant Physiology (UPC: 32161502)</b>	
CO1	The students are able to correlate morphology, anatomy, cell structure and biochemistry with plant functioning.
CO2	The link between theory and practical syllabus is established, and the employability of youth would be enhanced. The youth can also begin small-scale enterprises.
<b>DSE1: Analytical Techniques in Plant Sciences (UPC: 32167503)</b>	
CO1	Understanding of use of light, confocal transmission and electron microscopy, centrifugation, spectrophotometry, chromatography, x-ray diffraction technique and chromatography techniques
<b>DSE2: Biostatistics (UPC: 32167502)</b>	
CO1	Understanding of interpreting the scientific data that is generated during scientific experiments. It is the responsibility of biostatisticians and other experts to consider the variables in subjects to understand them, and to make sense of different sources of variation.
CO2	In essence, the goal of biostatistics is to disentangle the data received and make valid inferences that can be used to solve problems in public health.
CO3	Biostatistics uses the application of statistical methods to conduct research in the areas of biology, public health, and medicine. Many times, experts in biostatistics collaborate with other scientists and researchers
Semester 6	



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<b>CC13: Plant Metabolism (UPC: 32161601)</b>	
<b>CO1</b>	Concept and significance of metabolic redundancy in plants.
<b>CO2</b>	Students will also be able to learn the similarity and differences in metabolic pathways in animals and plants.
<b>CO3</b>	To have understanding of water and nutrient uptake and movement in plants, role of mineral elements, translocation of sugars, Role of various plant growth regulators, phytochrome cytochromes and phototropins, and flowering stimulus.
<b>CC14: Plant Biotechnology (UPC: 32161602)</b>	
<b>CO1</b>	Learn the basic concepts, principles and processes in plant biotechnology.
<b>CO2</b>	Have the ability of explanation of concepts, principles and usage of the acquired knowledge in biotechnological, pharmaceutical, medical, ecological and agricultural applications.
<b>CO3</b>	Use basic biotechnological techniques to explore molecular biology of plants
<b>CO4</b>	Explain how biotechnology is used to for plant improvement and discuss the biosafety concern and ethical issue of that use.
<b>DSE3: Industrial and Environmental Microbiology (UPC: 32167601)</b>	
<b>CO1</b>	To introduce students with the industrial microbiology: concepts, principles, scope and application
<b>CO2</b>	To introduce students with the environmental microbiology: concepts, principles, scope and application
<b>DSE4: Bioinformatics (UPC: 32167608)</b>	
<b>CO1</b>	With a working knowledge of the practical and theoretical concepts of bioinformatics, student will be qualified to progress onto advanced study.
<b>CO2</b>	The portfolio of skills developed on the programme is also suited to academic research or work within the bioinformatics industry as well as range of commercial settings.

**Mapping of Course Outcomes (COs) with Programme Outcomes (POs)\***  
 (\*For courses taught in III<sup>rd</sup> year LOCF)

Paper	Course Outcomes (CO)	Programme Outcomes				
		PO1	PO2	PO3	PO4	PO5
<b>Semester 5</b>						
<b>CC11: Reproductive Biology of Angiosperms (UPC: 32161501)</b>	<b>CO1</b>	✓		✓		
	<b>CO2</b>	✓				
	<b>CO3</b>	✓				
	<b>CO4</b>	✓		✓		
	<b>CO5</b>	✓	✓			
	<b>CO6</b>	✓	✓		✓	✓
<b>CC12: Plant Physiology (UPC: 32161502)</b>	<b>CO1</b>	✓	✓	✓		
	<b>CO2</b>	✓	✓	✓	✓	✓



<b>DSE1: Analytical Techniques in Plant Sciences (UPC: 32167503)</b>	<b>CO1</b>	✓	✓	✓	✓	✓
<b>DSE2: Biostatistics (UPC: 32167502)</b>	<b>CO1</b>	✓		✓		
	<b>CO2</b>	✓		✓	✓	✓
	<b>CO3</b>	✓	✓	✓		✓
<b>Semester 6</b>						
<b>CC13: Plant Metabolism (UPC: 32161601)</b>	<b>CO1</b>	✓	✓			
	<b>CO2</b>	✓	✓			
	<b>CO3</b>	✓	✓			
<b>CC14: Plant Biotechnology (UPC: 32161602)</b>	<b>CO1</b>	✓	✓			✓
	<b>CO2</b>	✓	✓	✓		✓
	<b>CO3</b>		✓	✓		✓
	<b>CO4</b>		✓	✓	✓	✓
<b>DSE3: Industrial and Environmental Microbiology (UPC: 32167601)</b>	<b>CO1</b>	✓	✓		✓	✓
	<b>CO2</b>	✓		✓		✓
<b>DSE4: Bioinformatics (UPC: 32167608)</b>	<b>CO1</b>	✓		✓		
	<b>CO2</b>	✓		✓		✓

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