

Dr.V.S.KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS) NODAL RESOURCE CENTRE & AU CENTRE FOR RESEARCH Maddilapalem, Visakhapatnam - 530013, Andhra Pradesh. 0891-2553262, https://www.drvskrishnagdc.edu.in



DEPARTMENT OF BOTANY

CO – PO ATTAINMENT METHODOLOGY

Step 1

Calculation of Course Outcome Weighted Average (COWA)

The performance of the students assessed by two methods

- (a) Direct Assessment: The weightage for internal exams is 30% and for semester end exams is 60%
- (b) Indirect assessment: 5% weightage for exit survey and 5% for extracurricular activities

The performance of the student is categorised in four levels

S,No	Percentage obtained by the student	Level weightage
	in DA and IDA	
1	Less than 35%	0
2	Between 35% and 50%	1
3	Between 51% and 70%	2
4	Above 70%	3

The average level of all students for a particular course is found. It is called as course outcome weighted average (COWA).

$\mathbf{COWA} = \frac{\textit{some of the level weitage of all students of a course}}{\textit{total number of students}}$

➢ Step 2:

Calculation of Course outcome level index (COLLI):

To Map the course outcomes (COs) of a course with Blooms levels (1 to 6) by using action verbs used in CO's. A course outcome may be mapped to multiple Blooms levels; hence we need to calculate the average Blooms level weightage (ABLW).

 $COLLI = \frac{Sum of the weigtages of blooms levels mapped}{number of levels mapped}$

➤ Step 3:

CO-PO mapping and CO-PSO mapping

Map each course outcome with POs and PSOs in levels 0,1,2,3. A CO may be mapped to multiple POs or PSOs with different levels 1,2,3. The weighted average of each PO is to be calculated.

➤ Step 4:

Calculation of CO attainment:

The formula for Course Outcome Attainment (CO Attainment) can be calculated by using below formula

CO attainment = COWA +
$$\left\{ (3 - COWA) \times \left(1 - \frac{COLLI}{3.5} \right) \right\}$$

(Blooms Level Weighted Average value = 3.5)

➤ Step 5:

Calculation of PO attainment:

The formula for Programme Outcome Attainment (PO Attainment) can be calculated by using below formula

PO Attainment = $\frac{\Sigma(CO \ attainment)(PO \ level \ mapped \ with \ CO)}{Sum \ of \ the \ PO \ levels \ mapped \ with \ CO}$

PSO attainment:

The formula for Programme Specific Outcome Attainment (PSO Attainment) can be calculated by using below formula

 $PSO Attainment = \frac{\Sigma(CO \ attainment)(PSO \ level \ mapped \ with \ CO)}{Sum \ of \ the \ PSO \ levels \ mapped \ with \ CO}$



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DEPARTMENT OF BOTANY POs & COs MAPPING 2022--2023

Department of Botany

Programme Name: BSc. (BZC)

Levels of Bloom's Taxonomoy

Level-1	Knowlede/Remember
Level-2	Understand
Level-3	Application
Level-4	Analyze
Level-5	Evaluation
Level-6	Create

Bloom's Taxonomy



POs	Programme Outcomes
PO1	Critical Thinking: Ability to take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO2	Effective Communication: Ability to speak, read, write, and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO3	Social Interaction: Ability to elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO4	Effective Citizenship: Ability to demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO5	Ethics: Ability to recognize different value systems includingy our own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO6	Environment and Sustainability: Ability to understand the issues of environmental contexts and sustainable Development.
PO7	Employabilityskills: Equipping graduates with the essential abilities and knowledge to excel in their choosen careers.
PO8	Entrepreneurships kills: Seeks to empower students with the competencies needed to be successful entrepreneours, enabling themto launch, operate, and innovate in their own businesses or entrepreneurial ventures.
PO9	Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PSOs	Program Specific Outcomes (PSOs)
PSO1	Analyze the relationships among animals, plants and microbes
PSO2.	Understand the nature and basic concepts of anatomy, embryology And Plant Ecology.
PSO3	Understand structure of Cell and functions of cell organelles. Plant breeding ; Biochemistry , Plant Physiology and Plant Biotechnology; EconomicBotany.
PSO4	Undertand the concept of gene, Heridity and Hybridization
PSO5	Know and understand different Physiological functions and Biochemical pathways in Plants and cell.
PSO6	Understand, identify and utilize different Economically useful Plants in life.
PSO7	Perform procedures as per laboratory standards in the areas of plant Anatomy, Embryology, Ecology, CellBiology, Plant Breeding, Plant Physiology and Plant Biotechnology.

COURSE OUTCOMES

SEMESTER – 1

P-I FUNDAMENTAL OF MICROBES AND NON- VASCULAR PLANTS

- CO1: The structure in relation to function of cells the fundamental unit of life, are concerned in this course along with molecular present in cells and the flow they make the basic framework of cells and their continuity
- CO2: awareness created on diversity on Algae,

Fungi& lichens

CO3: knowledge created on microbial diversity

CO4: compare and anlyse the difference between

Eubacteria, archi bacteria and cyano bacteria

Co5: the students get knowledge about economic importance of Microbes

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: The structure in relation to function of cells the fundamental unit of life, are concerned in this course along with molecular present in cells and the flow they make the basic framework of cells and their continuity	Level1(Knowledge) Level2(Understanding)	1.5
CO2: awareness created on diversity on Algae, Fungi& lichens	Level1(Knowledge) Level2(Understanding)	1.5
CO3: knowledge created on on microbial diversity	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
CO-4 : compare and anlyse the difference between Eubacteria,archi bacteria and cyano bacteria	Level3(Application) Level4(Analysing) Level5(Evaluation)	4
Co5: the students get knowledge about economic importance of Microbes	Level2(Understanding) Level3(Applying) Level4(Analysing) Level5(Evaluation)	3.5

CO-PO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	0	1	1	0	2	1	1	3
CO2	2	0	0	0	1	2	1	2	1
CO3	1	1	0	1	2	1	1	0	2
CO4	1	1	0	1	1	2	1	0	2
CO5	3	2	2	2	2	2	3	2	2

CO-PSO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	2	1
CO2	1	2	1	2	1	1
CO3	2	2	1	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	1	3

ATTAINMENT OF POs

PROGRAM OUTCOMES ATTAINMENT											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9		
CO 1	4.89795 9	0	2.44898	2.44898	0	4.897959	2.44898	2.44898	7.346939		
CO2	4.89795 9	0	0	0	2.44898	4.897959	2.44898	4.897959	2.44898		
CO3	2.26530 6	2.265306	0	2.265306	4.53061 3	2.265306	2.265306	0	4.530613		
CO4	1.53061 3	1.530613	0	1.530613	1.53061 3	3.061225	1.530613	0	3.061225		
CO 5	5.14285 8	3.428572	3.428572	3.428572	3.42857 2	3.428572	5.142858	3.428572	3.428572		
FINAL ATTAI NMEN T	2.08163 3	1.806123	1.959184	1.934694	1.98979 6	2.061225	1.976677	2.155102	2.081633		

PROGRAM SPECIFIC OUTCOMES ATTAINMENT									
	PSO1	PSO2	PSO3	PSO4	PSO5				
CO 1	7.346939	7.346939	2.44898	4.897959	4.897959				
CO2	2.44898	4.897959	2.44898	4.897959	2.44898				
CO3	4.530613	4.530613	2.265306	6.795919	2.265306				
CO4	1.530613	1.530613	1.530613	3.061225	1.530613				
CO 5	3.428572	1.714286	1.714286	1.714286	1.714286				
FINAL ATTAINMENT	2.142857	2.22449	2.081633	2.136735	2.142857				

I B.Sc., -Botany-I/ I Semester End

FUNDAMENTAL OF MICROBES AND NON- VASCULAR PLANTS

12 Hrs.

UNIT – I: ORIGIN OF LIFEANDVIRUSES

- 1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classification of R.H. Whittaker
- 2. Discovery of microorganisms, Pasteur experiments, germ theory of diseases.
- 3. Shape and symmetry of viruses; structure of TMV and Gemini virus; multiplication of TMV; A brief account of Prions and Viroids.
- 4. A general account on symptoms of plant diseases caused by Viruses. Transmission of plant viruses and their control.
- 5. Significance of viruses in vaccine production, bio-pesticides and as cloningvectors.

UNIT – II: SPECIAL GROUPS OF BACTERIAANDEUBACTERIA 12 Hrs.

- 1. Brief account of Archaebacteria, Actinomycetes and Cyanobacteria.
- 2. Cell structure and nutrition of Eubacteria.

- 3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
- 4. Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine).
- 5. A general account on symptoms of plant diseases caused by Bacteria; Citruscanker.
 UNIT 3: FUNGI & LICHENS 12 Hrs.
- 1. General characteristics of fungi and Ainsworth classification (uptoclasses).
- 2. Structure, reproduction and life history of (a) Rhizopus (Zygomycota) and (b) Puccinia (Basidiomycota).
- 3. Economic uses of fungi in food industry, pharmacy and agriculture.
- 4. A general account on symptoms of plant diseases caused by Fungi; Blast ofRice.
- 5. Lichens- structure and reproduction; ecological and economicimportance.

UNIT –4:ALGAE 12 Hrs.

- 1. General characteristics of Algae (pigments, flagella and reserve food material); Fritsch classification (uptoclasses).
- 2. Thallus organization and life cycles inAlgae.
- Occurrence, structure, reproduction and life cycle of (a) Spirogyra (Chlorophyceae)and (b) Polysiphonia (Rhodophyceae).
- 4. Economic importance of Algae.

UNIT -5:BRYOPHYTES 12 Hrs.

- 1. General characteristics of Bryophytes; classification uptoclasses.
- 2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) Marchantia (Hepaticopsida) and (b)Funaria(Bryopsida).

General account on evolution of sporophytes inBryophyta

SEMESTER – 2

P-II: BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY

COURSE OUTCOMES

CO1: the students learn abot Diversified plant groups in vascular plants CO2:understand the flowering seeded classification & Nomen clature CO3: they get complete knowledge about important families like ASTERACEAE &POACEAE CO4: Create knowledge about the plant groups & eco types CO5: The students will understand about the phytogeographical zones

Learning Outcomes: On Completion of the course, the students will be able to	Knowledgelevel(Bloom's Taxonomy)	averag
CO1: the students learn about	Level1(Knowledge)	1.5
Diversified plant groups in vascular plants	Level2(Understanding)	
CO2: understand the flowering	Level1(Knowledge)	1.5
seeded classification & Nomenclature	Level2(Understanding)	
CO3: they get complete knowledge about	Level1(Knowledge)	2
&POACEAE	Level2(Understanding)	
	Level3(Application)	
CO-4 : Create knowledge about the plant	Level2(Understanding)	3.5
groups & eco types	Level3(Application)	
	Level4(Analysing)	
	Level5(Evaluation)	
Co5:The studenwill understand about the	Level2(Understanding)	3.5
phytogeographical zones	Level3(Applying)	
	Level4(Analysing)	
	Level5(Evaluation)	

COs-POs Mapping

1-Low, 2-Moderate ,3-High, '-' No Correletion

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	1	1	1	1	1	2	3	2	1
CO2	1	0	0	1	1	2	3	2	0
CO3	1	0	1	0	1	2	3	2	1
CO4	1	2	1	1	1	3	3	3	1
CO5	1	1	1	0	0	2	2	2	0

COs-PSOs Mapping

1-Low, 2-Moderate ,3-High, '-' No Correletion

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	2	3	1	1	2	3
CO2	2	3	1	2	3	2	1
CO3	2	1	2	1	1	2	2
CO4	3	3	2	2	1	3	3
CO5	3	3	2	1	2	1	1

	PROGRAM OUTCOMES ATTAINMENT											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO 1	2.44898	2.44898	2.44898	2.44898	2.44898	4.897959	7.346939	4.897959	2.44898			
CO2	2.44898	0	0	2.44898	2.44898	4.897959	7.346939	4.897959	0			
CO3	2.26530 6	0	2.265306	0	2.26530 6	4.530613	6.795919	4.530613	2.265306			
CO4	1.71428 6	3.428572	1.714286	1.714286	1.71428 6	5.142858	5.142858	5.142858	1.714286			
CO 5	1.71428 6	1.714286	1.714286	0	0	3.428572	3.428572	3.428572	0			
FINAL ATTAI NMEN T	2.11836 8	1.897959	2.035715	2.204082	2.21938 8	2.081633	2.147231	2.081633	2.142857			

ATTAINMENT OF POs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT									
	PSO1	PSO2	PSO3	PSO4	PSO5				
CO 1	7.346939	4.897959	7.346939	2.44898	2.44898				
CO2	4.897959	7.346939	2.44898	4.897959	7.346939				
CO3	4.530613	2.265306	4.530613	2.265306	2.265306				
CO4	5.142858	5.142858	3.428572	3.428572	1.714286				
CO 5	5.142858	5.142858	3.428572	1.714286	3.428572				
FINAL ATTAINMENT	2.081633	2.066327	2.118368	2.107872	2.15051				

I B.Sc., -Botany-II/ II Semester BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY UNIT –I: PTERIDOPHYTES

- 1. General characteristics of Pteridophyta; classification of Smith (1955) uptodivisions.
- 2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) Lycopodium (Lycopsida) and (b) Marsilea(Filicopsida).
- 3. Stelar evolution inPteridophytes;
- 4. Heterospory and seedhabit.

UNIT-II:GYMNOSPERMS

- 1. General characteristics of Gymnosperms; Sporne classification upto classes.
- 2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) Cycas (Cycadopsida) and (b) Gnetum(Gnetopsida).
- 3. Outlines of geological timescale.
- 4. A brief account onCycadeoidea.

UNIT - III: BASIC ASPECTSOFTAXONOMY

- 1. Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genusand family.
- 2. Plant nomenclature: Binomial system, ICBN- rules fornomenclature.
- 3. Herbarium and its techniques, BSI herbarium and Kew herbarium; concept of digital herbaria.
- 4. Bentham and Hooker system of classification;
- 5. Systematic description and economic importance of the followingfamilies:(a) Annonaceae (b)Curcurbitaceae

UNIT - IV:SYSTEMATICTAXONOMY

- Systematic description and economic importance of the followingfamilies:
 (a) Asteraceae (b) Asclepiadaceae (c) Amaranthaceae (d)Euphorbiaceae
 (e) Arecaceae and (f) Poaceae
- 2. Outlines of Angiosperm Phylogeny Group (APGIV).

UNIT-V:PHYTOGEOGRAPHY

- 1. Principles of Phytogeography, Distribution (wides, endemic, discontinuousspecies)
- 2. Endemism types and causes.
- 3. Phytogeographic regions of World.
- 4. Phytogeographic regions ofIndia.
- 5. Vegetation types in AndhraPradesh.

SEMESTER-3

P-III: Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

CO1: they get knowledge about the basic anatomical features of plants

Co2 understand the embryological developments in plants

Co3: learn about the concept s of population e cology

Co4: learn about causes for loss of biodiversity

Co5 : analyse the biodiversity conservation methods

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: : they get knowledge about the	Level1(Knowledge)	1.5
basic anatomical features of plants	Level2(Understanding)	
CO2: understand the embryological	Level1(Knowledge)	1.5
developments in plants	Level2(Understanding)	
CO3: learn about the concept s of population e	Level1(Knowledge)	2.5
cology	Level2(Understanding)	
	Level3(Application)	
	Level4(Analysing	
CO-4 : learn about causes for loss of	Level3(Application)	4
biourversity	Level4(Analysing)	
	Level5(Evaluation)	
Co5: analyse the biodiversity conservation	Level2(Understanding)	3.5
methods	Level3(Applying)	
	Level4(Analysing)	
	Level5(Evaluation)	

CO-PO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	0	1	1	0	2	1	1	3
CO2	2	0	0	0	1	0	1	2	1
CO3	1	1	0	2	1	1	1	0	2
CO4	1	1	0	1	1	2	1	0	2
CO5	3	2	2	2	2	1	3	2	2

CO-PSO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	2	1
CO2	1	2	1	2	1	1
CO3	2	2	1	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	1	3

ATTAINMENT OF POs

	PROGRAM OUTCOMES ATTAINMENT												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				
CO 1	5.45816 3	0	2.729082	2.729082	0	5.458163	2.729082	2.729082	8.187245				
CO2	5.45816 3	0	0	0	2.72908 2	0	2.729082	5.458163	2.729082				
СОЗ	2.54846 9	2.548469	0	5.096939	2.54846 9	2.548469	2.548469	0	5.096939				
CO4	2.27755 1	2.277551	0	2.277551	2.27755 1	4.555102	2.277551	0	4.555102				
CO 5	7.10357 1	4.735714	4.735714	4.735714	4.73571 4	2.367857	7.103571	4.735714	4.735714				
FINAL ATTAI NMEN T	2.53843 5	2.390434	2.488265	2.473214	2.45816 3	2.488265	2.483965	2.584592	2.530408				

PROGRAM SPECIFIC OUTCOMES ATTAINMENT									
	PSO1	PSO2	PSO3	PSO4	PSO5				
CO 1	8.187245	8.187245	2.729082	5.458163	5.458163				
CO2	2.729082	5.458163	2.729082	5.458163	2.729082				
CO3	5.096939	5.096939	2.548469	7.645408	2.548469				
CO4	2.277551	2.277551	2.277551	4.555102	2.277551				
CO 5	4.735714	2.367857	2.367857	2.367857	2.367857				
FINAL ATTAINMENT	2.558503	2.598639	2.530408	2.548469	2.56352				

Semester/BotanyCore Course-3

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Unit-1:AnatomyofAngiosperms

Organizationofapicalmeristems: Tunica-carpustheoryandHistogen theory.

- 1. Tissuesystems-Epidermal, ground and vascular.
- 2. Anomaloussecondarygrowthin Boerhaavia and Dracaena.
- 3. Studyoftimbersofeconomic importance-Teak,Redsandersand Rosewood.

Unit-2:Embryologyof Angiosperms

- 1. Structureofanther, anther wall, types of tapetum. Microsporogenesis and development of male gametophyte.
- Structureofovule, megasporogenesis; monosporic(*Polygonum*), bisporic(*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
- 3. Outlinesofpollination,pollen-pistilinteractionand fertilization.
- 4. Endosperm-Typesandbiologicalimportance-Freenuclear, cellular, helobialand ruminate.
- 5. DevelopmentofDicot(Capsellabursa-pastoris)embryo.

Unit-3:Basics ofEcology

- 1. Ecology:definition,branchesandsignificanceofecology.
- 2. Ecosystem: Conceptand components, energy flow, food chain, food web,

ecologicalpyramids.

4. Plantsandenvironment:Climatic(lightandtemperature),edaphicandbiotic factors.

5. Ecological succession: Hydrosere and Xerosere

Unit-4:Population,CommunityandProductionEcology

Populationecology:Natality,mortality,growthcurves,ecotypes,ecads

- 1. Communityecology:Frequency,density,cover,lifeforms,biological spectrum
- 2. Conceptsofproductivity: GPP,NPP and CommunityRespiration
- 3. Secondaryproduction, P/R ratioandEcosystemsUnit-5:Basicsof Biodiversity
- 1. Biodiversity:Basicconcepts,ConventiononBiodiversity-EarthSummit.
- 2. ValueofBiodiversity;typesandlevels ofbiodiversityand Threatsto biodiversity
- 3. BiodiversityHotspotsinIndia.BiodiversityinNorthEasternHimalayasandWestern Ghats.
- 4. Principlesofconservation: IUCNthreat-categories, REDdata book
- 5. RoleofNBPGRandNBAintheconservation of Biodiversity.

SEMESTER – 4 P-IV: Plant Physiology and Metabolism

CO1: knowledge about the metabolism

of plant

CO2: The students can understand about

the mechanism of absorption of water in

plants

CO3: aware with the mechanism of photosynthesis, respiration in plants

CO4: knowledge developed about phytoharmonal regulations and photo periodism

CO4 ; The students can differentiate co2 fixation in c3&c4 cycles .

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: knowledge about the metabolism of plant	Level1(Knowledge) Level2(Understanding) Level4(Analysing)	2.3
CO2: The students can understand	Level1(Knowledge)	2.6
about the mechanism of water in	Level2(Understanding)	
plants	Level5(Evaluation)	
CO3: aware with the mechanism of	Level1(Knowledge)	2.5
photosynthesis, respiration in plants	Level2(Understanding)	
	Level3(Application)	
	Level4(Analysing	
CO-4 : knowledge developed about	Level3(Application)	4
periodism	Level4(Analysing)	
	Level5(Evaluation)	
CO5: The students can differentiate CO2	Level2(Understanding)	3.5
fixation in C3&C4 cycles .	Level3(Applying)	
	Level4(Analysing)	
	Level5(Evaluation)	

CO-PO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	0	1	1	0	2	1	1	3
CO2	2	0	0	0	1	2	1	2	1
CO3	1	2	0	2	2	1	1	0	2
CO4	1	1	0	1	1	2	0	1	2
CO5	3	2	2	2	2	2	3	2	2

CO-PSO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	2	1
CO2	1	2	1	2	1	1
CO3	2	2	1	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	1	3

ATTAINMENT OF POs

	PROGRAM OUTCOMES ATTAINMENT												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				
CO 1	5.31	0	2.655	2.655	0	5.31	2.655	2.655	7.965				
CO2	5.22	0	0	0	2.61	5.22	2.61	5.22	2.61				
СОЗ	2.625	5.25	0	5.25	5.25	2.625	2.625	0	5.25				
CO4	2.4	2.4	0	2.4	2.4	4.8	0	2.4	4.8				
CO 5	7.425	4.95	4.95	4.95	4.95	4.95	7.425	4.95	4.95				
FINAL ATTAINMENT	2.55333 3	2.52	2.535	2.5425	2.535	2.545	2.5525	2.5375	2.5575				

PROGRAM SPECIFIC OUTCOMES ATTAINMENT										
	PSO1	PSO2	PSO3	PSO4	PSO5					
CO 1	7.965	7.965	2.655	5.31	5.31					
CO2	2.61	5.22	2.61	5.22	2.61					
CO3	5.25	5.25	2.625	7.875	2.625					
CO4	2.4	2.4	2.4	4.8	2.4					
CO 5	4.95	2.475	2.475	2.475	2.475					
FINAL ATTAINMENT	2.575	2.59	2.553	2.568	2.57					

II B.Sc. BOTANY, SEMESTER- IV, Paper-IV: THEORY

SYLLABUS PAPER – IV: Plant Physiology and Metabolism

UNIT – I: Plant – Water relations

- 1. Physical properties of water, Importance of water to plant life.
- 2. Diffusion, imbibition and osmosis; concept & components of Waterpotential.
- 3. Absorption and transport of water and ascent ofsap.
- 4. Transpiration –Definition, types of transpiration, structure and opening and closing mechanism of stomata.

UNIT -II: Mineral nutrition&Enzymes

- 1. Mineral Nutrition: Essential elements (macro and micronutrients) and their rolein plant metabolism, deficiencysymptoms.
- 2. Mineral ion uptake (active and passivetransport).
- 3. Nitrogen metabolism- biological nitrogen fixation in *Rhizobium*, outlines of protein synthesis (transcription and translation).
- 4. Enzymes: General characteristics, mechanism of enzyme action and factors regulating enzymeaction.

UNIT-III: PHOTOSYNTHESIS

- Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photo- phosphorylation, carbon assimilation pathways: C3, C4, and CAM (briefaccount)
- 2. Photorespiration and itssignificance.
- 3. Translocation of organic solutes: mechanism of phloem transport, source- sinkrelationships.

UNIT - IV:RESPERATION&LIPIDMETABOLISM

- 1. Respiration: Glycolysis, anaerobic respiration, TCA cycle, electrontransport system. Mechanism of oxidativephosphorylation.
- 2. Lipid Metabolism: Types of lipids, Beta-oxidation.

UNIT -V: GROWTH AND DEVELOPMENT

- 1. Growth and development: definition, phases and kinetics of growth.
- 2. Physiological effects of phytohormones Auxins, Gibberellins,Cytokinins, ABA, Ethylene andBrassinosteroids.
- 3. Physiology of flowering -photoperiodism, role of phytochromein flowering;Vernalization.
- 4. Physiology of Scenescence and Ageing.

SEMESTER -5 Paper-V: Cell Biology, Genetics and Plant Breeding

CO1: detailed study about ultra-structure of cell is possible

CO2: the student will understand the structure of DNA &RNA

CO3: detailed study about ultra-structure of cell is possible

CO4: plant genome study in structural and functional aspect is possible

Co5: the students can analyse the significance of mutations in molecular breeding

Learning Outcomes: On Completion of the course,the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: detailed study about ultra-structure of cell is possible	Level1(Knowledge) Level2(Understanding)	1.5
CO2: the student will understand the structureof DNA &RNA	Level1 (Knowled ge) Level2 (Understanding) Level5 (Evaluati on)	2.6
CO3: detailed study about ultra-structure of cell is possible	Level1(Knowledge) Level2(Understanding) Level3(Application) Level4(Analysing)	2.5
CO-4 : plant genome study in structural andfunctional aspect is possible	Level2(Understanding) Level3(Application) Level4(Analysing) Level5(Evaluation)	3.5
CO5: the students can analyse the significance of mutations in molecular breeding.	Level2(Understanding) Level3(Applying) Level4(Analysing) Level5(Evaluation)	3.5

CO-PO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	0	1	1	0	2	1	1	3
CO2	2	0	0	0	1	2	1	2	1
CO3	1	1	0	2	1	1	1	0	2
CO4	1	2	0	1	1	2	1	0	2
CO5	3	2	2	2	2	2	3	2	2

CO-PSO Mapping

1-Low, 2-Moderate, 3-High, '- 'No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	2	1
CO2	1	2	1	2	1	1
CO3	2	2	1	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	1	3

	PROGRAM OUTCOMES ATTAINMENT								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	5.47548	0	2.73774	2.73774	0	5.47548	2.73774	2.73774	8.21322
CO2	5.23769 8	0	0	0	2.61884 9	5.237698	2.618849	5.237698	2.618849
CO3	2.5629	2.5629	0	5.1258	2.5629	2.5629	2.5629	0	5.1258
CO4	2.38806	4.77612	0	2.38806	2.38806	4.77612	2.38806	0	4.77612
CO 5	7.16418	4.77612	4.77612	4.77612	4.77612	4.77612	7.16418	4.77612	4.77612
FINAL ATTAI NMEN T	2.53648	2.423028	2.50462	2.50462	2.46918 6	2.53648	2.495961	2.550312	2.551011

ATTAINMENT OF POs

PROGR	PROGRAM SPECIFIC OUTCOMES ATTAINMENT							
	PSO1	PSO2	PSO3	PSO4	PSO5			
CO 1	8.21322	8.21322	2.73774	5.47548	5.47548			
CO2	2.618849	5.237698	2.618849	5.237698	2.618849			
CO3	5.1258	5.1258	2.5629	7.6887	2.5629			
CO4	2.38806	2.38806	2.38806	4.77612	2.38806			
CO 5	4.77612	2.38806	2.38806	2.38806	2.38806			
FINAL ATTAINMENT	2.569117	2.59476	2.539122	2.556606	2.572225			

III B. Sc - SEMESTER- V: BOTANY SYLLABUS THEORY PAPE–V

Paper-V: Cell Biology, Genetics and Plant Breeding

UNIT – I Cell Biology:

- 1. Cell, the unit of life- Cell theory, Prokaryotic and eukaryotic cells;Eukaryotic cellcomponents.
- 2. Ultra structure and functions of cell wall and cellmembranes.
- 3. Chromosomes: morphology, organization of DNA in achromosome (nucleosome model), Euchromatin andheterochromatin.

UNIT – II Genetic Material:

DNA as the genetic material: Griffith's and Avery'stransformation experiment,

Hershey - Chase bacteriophageexperiment.

1. DNA structure (Watson & Crick model) and replication of DNA(semi-conservative)

2.Different forms of DNA (A-DNA, B-DNA, Z-DNA)

3. Types of RNA (mRNA, tRNA, rRNA), their structure and function.

UNIT - III Mendelian Inheritance:

- 1. Mendel's laws of Inheritance (Mono- and Di- hybrid crosses); backcrossand testcross.
- 2. Chromosome theory of Inheritance.
- 3.Linkage: concept, complete and incomplete linkage, coupling and repulsion; linkage mapsbased on two and three factorcrosses.
- 4. Crossing Over: concept & significance.

UNIT – IV PlantBreeding:

- 1. Introduction and Objectives of plantbreeding.
- 2. Methods of crop improvement: Procedure, advantages and limitations of Introduction, Selection, and Hybridization (outlinesonly).
- UNIT V Breeding, Crop ImprovementandBiotechnology:
 - 1. Role of mutations in cropimprovement.
 - 2. Role of somaclonal variations in cropimprovement.
 - 3.Molecular breeding use of DNA markers in plant breeding and cropimprovement (RAPD,RFLP).

SEMESTER-5

PAPER-VI, Elective-1: PLANT PROPAGATION

CO1: understand the Basic concepts of plant Propagation

CO2: the student will understand the advantages of apomixes in plant propagation

CO3: Analyse the propagation by cuttings

CO-4 : explain about propagation by layering

CO5: explain about propagation bygrafting and budding

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: understand the Basic concepts of plant Propagation	Level1(Knowledge) Level2(Understanding)	1.5
CO2: the student will understand the advantages of apomixes in plant propagation	Level1(Knowledge) Level2(Understanding) Level5(Evaluation)	2.6
CO3: Analyse the propagation by cuttings	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
CO-4 : explain about propagation by layering	Level2(Understanding) Level3(Application) Level4(Analysing) Level5(Evaluation)	3.5
CO5: explain about propagation bygrafting and budding	Level2(Understanding) Level3(Applying) Level4(Analysing) Level5(Evaluation)	3.5

CO-PO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	0	1	1	0	2	1	1	3
CO2	2	0	0	0	1	2	1	2	1
CO3	1	1	0	1	2	1	1	0	2
CO4	1	1	0	1	1	2	1	0	2
CO5	3	1	2	2	2	1	3	2	2

CO-PSO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	2	1
CO2	1	2	1	2	1	1
CO3	2	2	1	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	1	3

ATTAI	NMENT	OF POs
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	PROGRAM OUTCOMES ATTAINMENT										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9		
CO 1	5.93629 4	0	2.968147	2.968147	0	5.936294	2.968147	2.968147	8.904441		
CO2	5.88957 6	0	0	0	2.94478 8	5.889576	2.944788	5.889576	2.944788		
соз	2.95752 9	2.957529	0	2.957529	5.91505 8	2.957529	2.957529	0	5.915058		
CO4	2.92567 6	2.925676	0	2.925676	2.92567 6	5.851352	2.925676	0	5.851352		
CO 5	8.77702 8	2.925676	5.851352	5.851352	5.85135 2	2.925676	8.777028	5.851352	5.851352		
INAL TTAI IMEN T	2.9429	2.936294	2.939833	2.940541	2.93947 9	2.945053	2.939024	2.941815	2.946699		

PROGRAM SPECIFIC OUTCOMES ATTAINMENT								
	PSO1	PSO2	PSO3	PSO4	PSO5			
CO 1	8.904441	8.904441	2.968147	5.936294	5.936294			
CO2	2.944788	5.889576	2.944788	5.889576	2.944788			
CO3	5.915058	5.915058	2.957529	8.872587	2.957529			
CO4	2.925676	2.925676	2.925676	5.851352	2.925676			
CO 5	5.851352	2.925676	2.925676	2.925676	2.925676			
FINAL ATTAINMENT	2.949035	2.951159	2.944363	2.947548	2.948327			

SEMESTER-5

PAPER-VI, Elective-1: PLANT PROPAGATION

Unit-1:Basicconcepts of propagation

- 1. Propagation:Definition,needandpotentialitiesforplantmultiplication;asexual and sexual methods of propagation advantages and disadvantages.
- 2. Propagationfacilities:Mistchamber,humidifiers,greenhouses,glasshouses,coldframes, hot beds, poly-houses, phytotrons nursery tools and implements.
- 3. Identificationandpropagationbydivisionandseparation:Bulbs,pseudobulbs,corms, tubers and rhizomes; runners, stolons, suckers and offsets.

Unit-2:Apomictics in plant propagation

- 1. Apomixis:Definition,facultativeandobligate;types-recurrent,non-recurrent, adventitious and vegetative; advantages and disadvantages.
- 2. Polyembryony:Definition,classification,horticulturalsignificance;chimeraandbud sport.
- 3. Propagationofmango, Citrusand Alliumusingapomicticembryos.

Unit-3:Propagation by cuttings

- 1. Cuttings:Definition,differentmethodsofcuttings;rootandleaf cuttings.
- Stem cuttings: Definition of stem tip and section cuttings; plant propagation by herbaceous,softwood,semihardwood,hardwooda ndconiferousstemcuttings.
- 3. Physiologicalandbiochemicalbasisofrooting;factorsinf luencingrootingofcuttings; Use of plant growth regulators in rooting of cuttings.

Unit-4:Propagation by layering

- 1. Layering: Definition, principle and factors influencing layering.
- 2. Plantpropagationbylayering:Groundlayeringtiplayering,simplelayering,trench layering, mound (stool) layering and compound (serpentine layering).
- 3. Airlayeringtechnique-application inwoodytrees.

Unit- 5: Propagation by grafting and budding

- 1. Grafting:Definition,principle,types,graftincompatib ility,collectionofscionwood stick, scion-stock relationship, and their influences, bud wood certification; micrografting.
- 2. Propagationbyveneer, whip, cleft, side and barkgraftingtechniques.
- 3. Budding:Definition;techniquesof'T',inverted'T',patchandchi

Semester-V P-VII: Course 6D: Gardening and Landscaping

- CO1: Understand the Basic concepts of Gardening methods
- CO2: learn about the Graden opertions
- CO3: analyse about different types of Ornamntal plants
- CO-4 : learn about the propagation techniues
- CO5: explain about Land scaping methods

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average Level weightage
CO1: Understand the Basic concepts ofGardening methods	Level1(Knowledge) Level2(Understanding)	1.5
CO2: learn about the Graden opertions	Level1(Knowledge) Level2(Understanding) Level5(Evaluation)	2.6
CO3: analyse about different types of Ornamntal plants	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
CO4 : learn about the propagation techniues	Level2(Understanding) Level3(Application) Level4(Analysing) Level5(Evaluation)	3.5
CO5: explain about Land scaping methods	Level2(Understanding) Level3(Applying) Level4(Analysing) Level5(Evaluation)	3.5

CO-PO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	0	1	1	0	1	1	1	3
CO2	2	0	0	0	1	2	1	2	1
CO3	1	2	0	2	2	1	1	0	2
CO4	1	1	0	1	1	2	1	0	2
CO5	3	2	2	2	2	2	3	2	2

CO-PSO Mapping

1-Low, 2-Moderate, 3-High, '-' No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	2	1
CO2	1	2	1	2	2	1
CO3	2	1	1	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	1	3

ATTAINMENT OF POs

PROGRAM OUTCOMES ATTAINMENT										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO 1	5.85810 8	0	2.929054	2.929054	0	2.929054	2.929054	2.9290 54	8.78716 2	
CO2	5.75405 3	0	0	0	2.87702 7	5.754053	2.877027	5.7540 53	2.87702 7	
CO3	2.90540 5	5.81081	0	5.81081	5.81081	2.905405	2.905405	0	5.81081	
CO4	2.83445 9	2.834459	0	2.834459	2.83445 9	5.668918	2.834459	0	5.66891 8	
CO 5	8.50337 7	5.668918	5.668918	5.668918	5.66891 8	5.668918	8.503377	5.6689 18	5.66891 8	
FINAL ATTAI NMEN T	2.87282 2	2.862837	2.865991	2.873874	2.86520 2	2.865794	2.864189	2.8704 05	2.88128 3	

PROGRAM SPECIFIC OUTCOMES ATTAINMENT									
	PSO1	PSO2	PSO3	PSO4	PSO5				
CO 1	8.787162	8.787162	2.929054	5.858108	5.858108				
CO2	2.877027	5.754053	2.877027	5.754053	5.754053				
CO3	5.81081	2.905405	2.905405	8.716215	2.905405				
CO4	2.834459	2.834459	2.834459	5.668918	2.834459				
CO 5	5.668918	2.834459	2.834459	2.834459	2.834459				
FINAL ATTAINMENT	2.886486	2.889442	2.876081	2.883175	2.883783				

Semester-V Course 6D: Gardening and Landscaping

Unit-1: Basics of Gardening

- 1. Gardenandgardening:Definitions,objectivesandscope;typesofgardens(domestic garden, flower garden, woodland garden, rock garden, water garden and herb and vegetable garden).
- 2. Specialitygardens(verticalgarden,roofgardenandscentedgarden);principlesof gardening; garden components and adornments;
- 3. Stylesof garden: formal, informal, freestyleand wild; some famous gardens of India.

Unit-2:Garden operations

- 1. Bio-aestheticplanning,eco-tourism,themeparks,indoorgardening,therapeutic gardening.
- 2. Gardeningoperations:soillaying,manuring,watering,managementofpestsanddiseases and harvesting.
- 3. Lawnmaking, methods of designing rockery and water garden.

Unit-3:Ornamentalplants

1. Ornamental plants: flowering annuals and perennials; climbers and creepers; shade and ornamental trees.

1. Bulbous and foliageornamental plants; cactiand succulents; palms, ferns.

2. Bonsai:definition,typesandstyles, artofmaking bonsai.

Unit-4:Propagation techniques

- 1. Propagationofornamental plantsbyrhizomes, cormstubers, bulbs and bulbils.
- 2. Vegetativepropagationtechniques-abriefaccountofcuttings, layering and grafting.
- 3. Typesofseedbeds;sowingofseedsandraisingseedlings,transplantingofseedlings; growing plants in pots, potting and repotting.

Unit-5: Landscaping

- 1. Landscaping:definition,landscapingofparksandpublic gardens.
- 2. Urbanplanningandplantingavenues;Landscapinghighwaysandeducational institutions; beautifying villages and colonies.
- 3. ComputerAidedDesigning(CAD)foroutdoor and indoor-scaping.