



Dr.V.S.KRISHNA GOVT. DEGREE COLLEGE

(AUTONOMOUS)

NODAL RESOURCE CENTRE & AU CENTRE FOR RESEARCH

Maddilapalem, Visakhapatnam - 530013, Andhra Pradesh.

0891-2553262, <https://www.drsvskrishnagdc.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 in DA and IDA	Level weightage
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).

$$\text{COWA} = \frac{\text{some of the level weightage of all students of a course}}{\text{total number of students}}$$

➤ 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).

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

➤ 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

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

(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

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

PSO attainment:

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

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



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DEPARTMENT OF BOTANY

2018-2019

POs & COs MAPPING

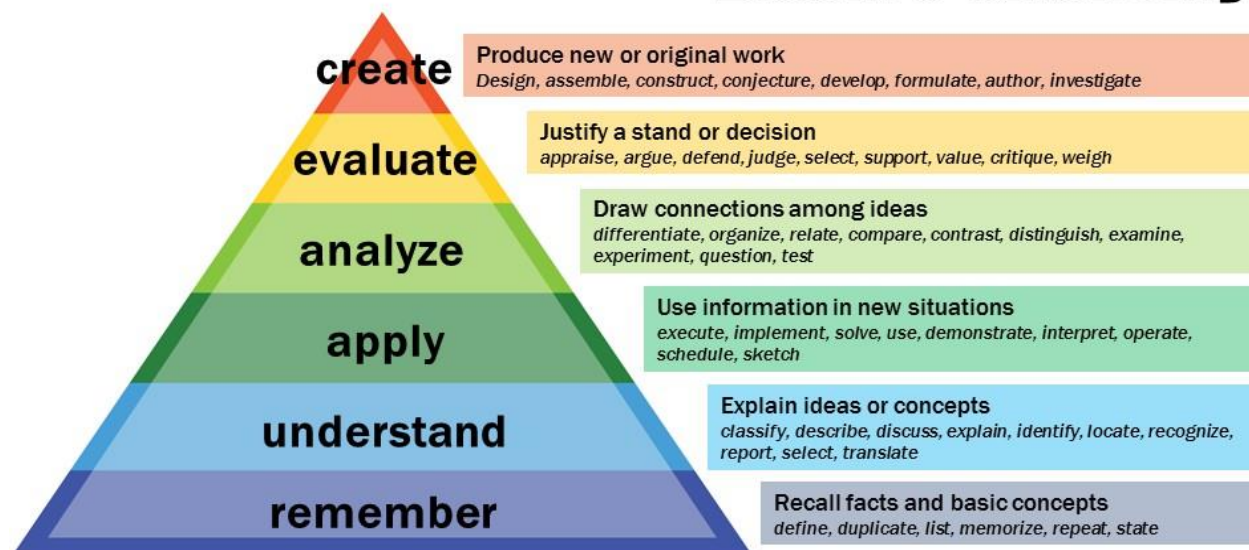
Department of Botany-

Programme Name: BSc. CBZ

Levels of Bloom's Taxonomy

Level-1	Knowledge/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 including 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	Employability skills: Equipping graduates with the essential abilities and knowledge to excel in their chosen careers.
PO8	Entrepreneurship skills: Seeks to empower students with the competencies needed to be successful entrepreneurs, enabling them to 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.

Program Specific Outcomes (PSOs)

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; Economic Botany.
PSO4	Understand the concept of gene, Heredity 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, Cell Biology, Plant Breeding, Plant Physiology and Plant Biotechnology.

SEMESTER – I
Paper – I : Microbial Diversity, Algae and Fungi

- 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
- CO3: knowledge created on microbial diversity
- Co4: they can differentiate the plant viral diseases and bacterial diseases
- Cos5: analyse the 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) Level3(Application)	2
CO3: knowledge created on microbial diversity	Level1(Knowledge) Level2(Understanding) Level4(Analysing)	2.3
CO4: compare and analyse 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	Level1(Understanding) Level3(Applying) Level4(Analysing) Level5(Evaluation)	3.2

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	0	0	0	1	0	2	1	2	1
CO3	1	1	0	2	2	0	0	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	1	1	1
CO5	2	2	1	1	1	3

ATTAINMENT OF POs

PROGRAM OUTCOMES ATTAINMENT									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	5.125714	0	2.562857	2.562857	0	5.125714	2.562857	2.562857	7.688571
CO2	0	0	0	2.417143	0	4.834286	2.417143	4.834286	2.417143
CO3	1.98	1.98	0	3.96	3.96	0	0	0	3.96
CO4	1.834286	1.834286	0	1.834286	1.834286	3.668571	1.834286	0	3.668571
CO 5	5.328	3.552	3.552	3.552	3.552	3.552	5.328	3.552	3.552
FINAL ATTAINMENT	2.038286	1.841571	2.038286	2.046612	1.869257	2.147571	2.023714	2.189829	2.128629

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	7.688571	7.688571	2.562857	5.125714	5.125714
CO2	2.417143	4.834286	2.417143	4.834286	2.417143
CO3	3.96	3.96	1.98	5.94	1.98
CO4	1.834286	1.834286	1.834286	1.834286	1.834286
CO 5	3.552	3.552	1.776	1.776	1.776
FINAL ATTAINMENT	2.161333	2.186914	2.114057	2.16781	2.188857

I B.Sc., -Botany-I/ I Semester
MICROBIAL DIVERSITY, ALGAE AND FUNGI

UNIT-I: MICROBIAL WORLD (Origin and Evolution of Life, Microbial diversity)

1. Discovery of microorganisms, origin of life, spontaneous, biogenesis, Pasteur experiments, germ theory of disease.
2. Classification of microorganisms – R.H. Whittaker's five kingdom concept.
3. Brief account of special groups of bacteria- Archaeobacteria, Mycoplasma, Chlamydia, Actinomycetes and Cyanobacteria.

UNIT-II: VIRUSES

1. Viruses- Discovery, general account, structure& replication of –T4 Phage (Lytic, Lysogenic) and TMV, Viroid's.
2. Plant diseases caused by viruses – Symptoms, transmission and control measures (Brief account only).
3. Study of Tobacco Mosaic, Bhendi Vein clearing and Papaya leaf curl diseases.

UNIT-III: BACTERIA

1. Bacteria: Discovery, General characteristics, cell structure and nutrition
2. Reproduction- Asexual and bacterial recombination (Conjugation, Transformation, Transduction).
3. Economic importance of Bacteria.

UNIT-IV: Algae

1. General account - thallus organization and reproduction in Algae.
2. Fritsch classification of Algae (up to classes only) and economic importance.
3. Structure, reproduction and life history of *Oedogonium*, *Ectocarpus* and Polysiphonia.

UNIT-V: FUNGI

1. General characteristics and outline classification (Ainsworth).
2. Structure, reproduction and life history of *Rhizopus* (Zygomycota), *Pencillium* (Ascomycota), and *Puccinia* (Basidiomycota).
3. Lichens-Structure and reproduction; ecological and economic importance.

SEMESTER – 2
DIVERSITY OF ARCHAEAGONIATES & PLANT ANATOMY

CO1: Diversified plant groups in vascular cryptogams

CO2: Deals with flowering seeded plants with economic importance

CO3: Analyze the tissue systems and their structural and functional role

CO4: deals with secondary growth of some important plants

Co5: undersabd about the economic importance of gymnosperms

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: Diversified plant groups in vascular plants	Level1(Knowledge) Level2(Understanding)	1.5
Co2 : Deals with flowering seeded classification and Nomen clture	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
Create knowledge about important families like ASTERACEAE&POACEAE	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
CO4: Create knowledge about the plant groups& eco types	Level3(Application) Level4(Analysing) Level6(create)	4.3
CO5: The students will understand about the phytogeographical zones	Level 2(Understanding) Level 3(Applying) Level 4(Analysing) Level 5(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	0	0	0	0	0	2	1	2	1
CO3	1	2	0	2	2	0	0	0	2
CO4	1	1	0	1	0	2	1	0	2
CO5	3	2	0	2	1	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	3	1
CO2	1	2	1	1	1	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	5.562857	0	2.781429	2.781429	0	5.562857	2.781429	2.781429	8.344286
CO2	0	0	0	0	0	5.417143	2.708571	5.417143	2.708571
CO3	2.708571	5.417143	0	5.417143	5.417143	0	0	0	5.417143
CO4	2.373429	2.373429	0	2.373429	0	4.746857	2.373429	0	4.746857
CO 5	7.032857	4.688571	0	4.688571	2.344286	4.688571	7.032857	4.688571	4.688571
FINAL ATTAINMENT	2.525388	2.495829	2.781429	2.543429	2.587143	2.551929	2.482714	2.577429	2.590543

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	8.344286	8.344286	2.781429	5.562857	8.344286
CO2	2.708571	5.417143	2.708571	2.708571	2.708571
CO3	5.417143	2.708571	2.708571	8.125714	2.708571
CO4	2.373429	2.373429	2.373429	4.746857	2.373429
CO 5	4.688571	2.344286	2.344286	2.344286	2.344286
FINAL ATTAINMENT	2.614667	2.648464	2.583257	2.60981	2.639878

I B.Sc., -Botany-II/ II Semester
DIVERSITY OF ARCHAEGONIATES & PLANT ANATOMY

UNIT – I: BRYOPHYTES

1. General characters, Classification (up to classes)
2. Structure, reproduction and Life history of *Marchantia*, and *Funaria*.
3. Evolution of Sporophyte in Bryophytes.

UNIT - II: PTERIDOPHYTES

1. General characters, classification (up to Classes)
2. Structure, reproduction and life history of *Lycopodium*, and *Marsilea*.
3. Heterospory and seed habit.
4. Stelar evaluation in Pteridophytes.

UNIT – III: GYMNOSPERMS

1. General characters, classification (up to classes)
2. Morphology, anatomy, reproduction and life history of *Pinus* and *Gnetum*
3. Economic importance.

UNIT –IV: Tissues and Tissue systems

1. Meristems - Root and Shoot apical meristems and their histological organization.
2. Tissues – Meristematic and permanent tissues (simple, complex, secretory)
3. Tissue systems–Epidermal, ground and vascular.

UNIT – V: Secondary growth

1. Anomalous secondary growth in *Achyranthes*, *Boerhaavia* and *Dracaena*.
2. Study of local timbers of economic Importance-Teak, Rosewood, Arjuna (Tellamaddi) Red sander.

SEMESTER-3

III Paper-III : Plant Taxonomy and Embryology

CO1: fundamental components of taxonomical study

CO2: Nomenclature of flowering plants and their distribution

CO3: Complete knowledge about important families like Cucurbitaceae, Rutaceae, etc.

CO4: Total awareness gained from plant embryology

Co5: they analyse the differences between monocots and Monoclamydae

Learning Outcomes:On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: fundamental components of taxonomical study	Level1(Knowledge) Level2(Understanding)	1.5
CO2: Nomenclature of flowering plants and their distribution	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
CO3: Complete knowledge about important families like Cucurbitaceae, Rutaceae, etc	Level1(Knowledge), Level2(Understanding) Level3(Application)	2
CO4: Total awareness gained from plant embryology	Level3(Application), Level4(Analysing) Level5(Evaluation)	4
Co5: They analyse the differences between monocots and Monochlamydae	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	1	1	1	0	2	1	1	3
CO2	0	0	1	1	0	2	1	2	1
CO3	1	1	0	2	2	1	0	1	1
CO4	1	1	0	1	0	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	4.992	2.496	2.496	2.496	0	4.992	2.496	2.496	7.488
CO2	0	0	2.328	2.328	0	4.656	2.328	4.656	2.328
CO3	2.328	2.328	0	4.656	4.656	2.328	0	2.328	2.328
CO4	1.656	1.656	0	1.656	0	3.312	1.656	0	3.312
CO 5	5.472	3.648	3.648	3.648	3.648	3.648	5.472	3.648	3.648
FINAL ATTAIN MENT	2.064	2.0256	2.118	2.112	2.076	2.104	1.992	2.188	2.122667

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	7.488	7.488	2.496	4.992	4.992
CO2	2.328	4.656	2.328	4.656	2.328
CO3	4.656	4.656	2.328	6.984	2.328
CO4	1.656	1.656	1.656	3.312	1.656
CO 5	3.648	1.824	1.824	1.824	1.824
FINAL ATTAINMENT	2.197333	2.253333	2.1264	2.1768	2.188

II B. Sc - SEMESTER –III: BOTANY THEORY PAPER –
III Paper-III : Plant Taxonomy and Embryology)

UNIT – I: INTRODUCTION TO PLANT TAXONOMY

1. Fundamental components of taxonomy (identification, nomenclature, classification)
2. Taxonomic resources: Herbarium- functions & important herbaria, Botanical gardens, Flora, Keys- single access and multi-access.
3. Botanical Nomenclature- Principles and rules of ICBN (ranks and names; principle of priority, binomial system; type method, author citation, valid-publication).

UNIT –II: CLASSIFICATION

1. Types of classification- Artificial, Natural and Phylogenetic.
2. Bentham & Hooker's system of classification- merits and demerits.
3. Engler & Prantle's system of classification- merits and demerits
4. Phylogeny – origin and evolution of Angiosperms

UNIT –III: SYSTEMATIC TAXONOMY-I

1. Systematic study and economic importance of the following families: Annonaceae, Brassicaceae, Rutaceae, Curcubitaceae, and Apiaceae.

UNIT –IV: SYSTEMATIC TAXONOMY-II

1. Systematic study and economic importance of plants belonging to the following families: Asteraceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae, Arecaceae, and Poaceae.

UNIT –V: EMBRYOLOGY

1. Anther structure, microsporogenesis and development of male gametophyte.
2. Ovule structure and types; Megasporogenesis, development of Monosporic, Bisporic and Tetrasporic types (*Peperomia*, *Drusa*, *Adoxa*) of embryo sacs.
3. Pollination and Fertilization (outline) Endosperm development and types.
4. Development of Dicot and Monocot embryos, Polyembryony.

SEMESTER – 4

Paper 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 phytohormonal regulations and photo periodism

CO5 ; 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) Level5(Evaluation)	2.6
CO2: The students can understand about the mechanism of absorption of water in plants	Level1(Knowledge) Level2(Understanding) Level3(Application)	2
CO3: aware with the mechanism of photosynthesis, respiration in plants	Level1(Knowledge), Level2(Understanding) Level4(Analysing)	2.3
CO4: knowledge developed about phyto-harmonal regulations and photo periodism	Level3(Application), Level4(Analysing) Level5(Evaluation)	4
CO5 ; The students can differentiate co ₂ fixation in c ₃ &c ₄ cycles	Level2(Understanding) Level4(Analysing) Level5(Evaluation)	3.6

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	1	2	1	1	3
CO2	1	0	1	1	0	2	1	2	1
CO3	1	1	0	2	2	0	0	0	2
CO4	1	1	0	1	2	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	1	1	1
CO5	2	1	1	1	1	3

PROGRAM OUTCOMES ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	4.5024	0	2.2512	2.2512	2.2512	4.5024	2.2512	2.2512	6.7536
CO2	2.424	0	2.424	2.424	0	4.848	2.424	4.848	2.424
CO3	2.3376	2.3376	0	4.6752	4.6752	0	0	0	4.6752
CO4	1.848	1.848	0	1.848	3.696	3.696	1.848	0	3.696
CO 5	5.8896	3.9264	3.9264	3.9264	3.9264	3.9264	5.8896	3.9264	3.9264
FINAL ATTAIN MENT	2.1252	2.028	2.1504	2.16068 6	2.0784	2.1216	2.0688	2.20512	2.14752

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	6.7536	6.7536	2.2512	4.5024	4.5024
CO2	2.424	4.848	2.424	4.848	4.848
CO3	4.6752	2.3376	2.3376	7.0128	2.3376
CO4	1.848	1.848	1.848	1.848	1.848
CO 5	3.9264	1.9632	1.9632	1.9632	1.9632
FINAL ATTAINMENT	2.1808	2.2188	2.1648	2.2416	2.214171

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 of sap.
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 role in plant metabolism, deficiency symptoms.
2. Mineral ion uptake (active and passive transport).
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 enzyme action.

UNIT–III:PHOTOSYNTHESIS

1. Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photo- phosphorylation, carbon assimilation pathways: C₃, C₄, and CAM (brief account)
2. Photorespiration and its significance.
3. Translocation of organic solutes: mechanism of phloem transport, source- sink relationships.

UNIT – IV:RESPIRATION&LIPIDMETABOLISM

1. Respiration: Glycolysis, anaerobic respiration, TCA cycle, electron transport system. Mechanism of oxidative phosphorylation.
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 and Brassinosteroids.
3. Physiology of flowering - photoperiodism, role of phytochrome in flowering; Vernalization.
4. Physiology of Senescence and Ageing.

SEMESTER -5 paper-V
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 structure of DNA & RNA	Level1(Knowledge) Level2(Understanding) Level4(Analysing)	2.3
CO3: detailed study about ultra structure of the cell	Level1(Knowledge), Level2(Understanding) Level4(Analysing)	2.3
CO4: plant genome study in structural and functional aspect is possible	Level3(Application), Level4(Analysing) Level5(Evaluation)	4
Co5: the students can analyse the significance of mutations in molecular breeding	Level2(Understanding) Level3(Application), 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	1	1	1	0	2	1	1	3
CO2	0	0	1	1	1	2	1	2	1
CO3	1	1	0	2	2	0	1	0	2
CO4	1	1	1	1	0	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	2	1	2	2	1
CO2	1	2	1	2	1	2
CO3	2	1	1	3	2	1
CO4	1	1	2	2	1	1
CO5	2	1	1	1	1	3

PROGRAM OUTCOMES ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	5.362286	2.681143	2.681143	2.681143	0	5.362286	2.681143	2.681143	8.043429
CO2	0	0	2.511086	2.511086	2.511086	5.022171	2.511086	5.022171	2.511086
CO3	2.511086	2.511086	0	5.022171	5.022171	0	2.511086	0	5.022171
CO4	2.149714	2.149714	2.149714	2.149714	0	4.299429	2.149714	0	4.299429
CO 5	6.768	4.512	4.512	4.512	4.512	4.512	6.768	4.512	4.512
FINAL ATTAINMENT	2.398727	2.370789	2.370789	2.410873	2.409051	2.399486	2.374433	2.443063	2.438811

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT

	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	8.043429	5.362286	2.681143	5.362286	5.362286
CO2	2.511086	5.022171	2.511086	5.022171	2.511086
CO3	5.022171	2.511086	2.511086	7.533257	5.022171
CO4	2.149714	2.149714	4.299429	4.299429	2.149714
CO 5	4.512	2.256	2.256	2.256	2.256
FINAL ATTAINMENT	2.470933	2.471608	2.376457	2.447314	2.471608

III B. Sc - SEMESTER- V: BOTANY SYLLABUS THEORY PAPER-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 cell components.
2. Ultra structure and functions of cell wall and cell membranes.
3. Chromosomes: morphology, organization of DNA in a chromosome (nucleosome model), Euchromatin and heterochromatin.

UNIT – II Genetic Material:

DNA as the genetic material: Griffith's and Avery's transformation experiment, Hershey – Chase bacteriophage experiment.

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); backcross and testcross.
2. Chromosome theory of Inheritance.
3. Linkage: concept, complete and incomplete linkage, coupling and repulsion; linkage maps based on two and three factor crosses.
4. Crossing Over: concept & significance.

UNIT – IV Plant Breeding:

1. Introduction and Objectives of plant breeding.
2. Methods of crop improvement: Procedure, advantages and limitations of Introduction, Selection, and Hybridization (outline only).

UNIT – V Breeding, Crop Improvement and Biotechnology:

1. Role of mutations in crop improvement.
2. Role of somaclonal variations in crop improvement.
3. Molecular breeding – use of DNA markers in plant breeding and crop improvement (RAPD, RFLP).

SEMESTER-V

PAPER-VI: PLANT ECOLOGY & PHYTOGEOGRAPHY

CO1: knowledge created about ecological plant species, ecotypes

CO2: awareness created about geographical distribution of plant species

CO3 :Analyse the bio geo chemical cycles.

Co4 They can learn about the concepts of population ecology

Co5: they can understand about the bio diversity conservation methods

Learning Outcomes: On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: knowledge created about ecological plant species, ecotypes	Level1(Knowledge) Level2(Understanding)	1.5
CO2: Gets knowledge and Understanding on Ecosystem, Plant Succession and importance	Level1(Knowledge) Level2(Understanding) Level3(Application),	2
CO3 :Analyse the bio geo chemical cycles.	Level1(Knowledge), Level2(Understanding) Level4(Analysing)	2.3
Co4 They can learn about the concepts of population ecology	Level4(Analysing) Level5(Evaluation)	4.5
Co5: they can understand about the bio diversity and conservation methods	Level2(Understanding) Level3(Application), 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	1	2	1	1	3
CO2	1	0	1	0	0	2	1	2	1
CO3	1	1	2	2	2	0	0	1	2
CO4	1	1	1	1	2	2	1	0	3
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	1	1	1
CO3	2	1	2	3	1	1
CO4	1	1	1	2	1	1
CO5	2	1	1	1	2	3

ATTAINMENT OF POs

PROGRAM OUTCOMES ATTAINMENT									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	5.434286	0	2.717143	2.717143	2.717143	5.434286	2.717143	2.717143	8.151429
CO2	2.622857	0	2.622857	0	0	5.245714	2.622857	5.245714	2.622857
CO3	2.566286	2.566286	5.132571	5.132571	5.132571	0	0	2.566286	5.132571
CO4	2.151429	2.151429	2.151429	2.151429	4.302857	4.302857	2.151429	0	6.454286
CO 5	7.02	4.68	4.68	4.68	4.68	4.68	7.02	4.68	4.68
FINAL ATTAINMENT	2.474357	2.349429	2.472	2.446857	2.404653	2.457857	2.418571	2.534857	2.458286

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	8.151429	8.151429	2.717143	5.434286	5.434286
CO2	2.622857	5.245714	2.622857	2.622857	2.622857
CO3	5.132571	2.566286	5.132571	7.698857	2.566286
CO4	2.151429	2.151429	2.151429	4.302857	2.151429
CO 5	4.68	2.34	2.34	2.34	4.68
FINAL ATTAINMENT	2.526476	2.556857	2.494	2.488762	2.493551

III B. Sc - SEMESTER- V: BOTANY THEORY SYLLABUS PAPER- VI: PLANT ECOLOGY& PHYTOGEOGRAPHY

UNIT – I. Elements of Ecology

Climatic Factors: Light, Temperature, precipitation.

1. Edaphic Factor: Origin, formation, composition and soil profile.
2. Biotic Factor: Interactions between plants and animals.

UNIT – II. Ecosystem Ecology

1. Ecosystem: Concept and components, energy flow, Food chain, Food web, Ecological pyramids.
2. Productivity of ecosystem-Primary, Secondary and Net productivity.
3. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

UNIT – II Population & Community Ecology

1. Population -definition, characteristics and importance, outlines – ecotypes.
2. Plant communities- characters of a community, outlines – Frequency, density, cover, life forms, competition.
3. Interaction between plants growing in a community.

UNIT – IV Phytogeography

Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)

1. Phytogeographic regions of India.
2. Phytogeographic regions of World.
3. Endemism – types and causes

UNIT- V: Plant Biodiversity and its importance

1. Definition, levels of biodiversity-genetic, species and ecosystem.
2. Biodiversity hotspots- Criteria, Biodiversity hotspots of India.
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
4. Seed banks - conservation of genetic resources and their importance

SEMESTER – 6

Paper VII-(B): Nursery, Gardening and Floriculture.

CO1: students understand different vegetative propagative methods

CO2: they develop skill towards floriculture

CO3: they learn about Nursery management methods

CO4: Ornamental plants study is possible

Co5: different land scapeing methods.

Learning Outcomes:On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1: students understand different vegetative propagative methods	Level1(Knowledge) Level2(Understanding) Level3(Application),	2
CO2: they develop skill towards floriculture	Level1(Knowledge) Level2(Understanding) Level3(Application), Level4(Analysing)	2.5
CO3: they learn about Nursery Management Methods	Level1(Knowledge), Level2(Understanding) Level4(Analysing)	2.3
CO4: Ornamental plants study is possible	Level4(Analysing) Level5(Evaluation)	4.5
Co5: different land scapeing methods	Level2(Understanding) Level3(Application), Level4(Analysing) Level5(Evaluation) Level6 (create)	4

CO-PO Mapping**1-Low, 2-Moderate, 3-High, ‘-‘ No Correlation**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	1	1	0	2	1	1	3
CO2	1	0	0	1	1	2	1	2	1
CO3	1	1	1	2	2	1	0	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	1	1	1
CO3	2	1	1	3	1	1
CO4	1	1	1	2	3	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	4.889143	2.444571	2.444571	2.444571	0	4.889143	2.444571	2.444571	7.333714
CO2	2.305714	0	0	2.305714	2.305714	4.611429	2.305714	4.611429	2.305714
CO3	2.361257	2.361257	2.361257	4.722514	4.722514	2.361257	0	0	4.722514
CO4	1.750286	1.750286	0	1.750286	1.750286	3.500571	1.750286	0	3.500571
CO 5	5.5008	3.6672	3.6672	3.6672	3.6672	3.6672	5.5008	3.6672	3.6672
FINAL ATTAINMENT	2.1009	2.044663	2.118257	2.127184	2.074286	2.1144	2.000229	2.14464	2.152971

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	7.333714	7.333714	2.444571	4.889143	4.889143
CO2	2.305714	4.611429	2.305714	2.305714	2.305714
CO3	4.722514	2.361257	2.361257	7.083771	2.361257
CO4	1.750286	1.750286	1.750286	3.500571	5.250857
CO 5	3.6672	1.8336	1.8336	1.8336	1.8336
FINAL ATTAINMENT	2.197714	2.236286	2.139086	2.1792	2.080071

B. Sc - BOTANY SYLLABUS SEMESTER- VI PAPER – VII – ELECTIVE

Paper VII-(B): Nursery, Gardening and Floriculture.

UnitI: Nursery:

Definition, objectives, scope and building up of infrastructure for nursery.

1. Planning and seasonal activities - Planting - direct seeding and transplants.
2. Nursery Management and Routine Garden Operations.

UnitIII: Gardening

1. Definition, objectives and scope - different types of gardening.
2. Landscape and home gardening - parks and its components, plant materials and design. Computer applications in landscaping and design..
3. Gardening operations: soil laying, manuring, watering.
4. Landscaping Places of Public Importance: Landscaping highways and Educational Institutions)
5. Some Famous gardens of India.

Unit III: Propagation methods

1. seedlings, transplanting of seedlings.
2. layering, cutting, selection of cutting, propagule collecting season,
3. cutting rooting medium and planting of cuttings – Hardening of plants.
4. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.
5. Green house - mist chamber, shed root, shade house and Glasshouse for propagation.

UnitIV: Floriculture:

1. Ornamental Plants: Flowering annuals; herbaceous, perennials; Divine vines; Shade and ornamental trees.

1. Ornamental bulbous and foliage plants; Cacti and succulents.

2. Ornamentals-palms.

3. Cultivation of plants in pots; Indoor gardening; Bonsai.

Unit V: Commercial Floriculture

1. Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers

3. Cultivation of Important cut flowers (Carnation, Aster, Dahlia, Gerbera, Anthuriums, Gladiolous, Marigold, Rose, Lilium)

4. Management of pests, diseases and harvesting.

Semester-VI Paper VIII, CLUSTER ELECTIVE, Cluster-A,

Paper VIII-A-1 : PLANT DIVERSITY AND HUMAN WELFARE

CO1:understand the significance of plants in human welfare

CO2: learn about bio diversity conservation

Co3:anlyse the commercial importance of wood

Co4 understad the sustainable methods and their significance

Co5: analyse the concept of ecological foot print

Learning Outcomes:On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1:understand the significance of plants in human welfare	Level1(Knowledge) Level2(Understanding) Level3(Application),	2
CO2: learn about bio diversity conservation	Level1(Knowledge) Level2(Understanding) Level4(Analysing) Level5(Evaluation)	3
Co3:anlyse the commercial importance of wood	Level1(Knowledge), Level2(Understanding) Level4(Analysing)	2.3
Co4 understad the sustainable methods and their significance	Level3(Application), Level4(Analysing) Level5(Evaluation)	4
Co5: analyse the concept of ecological foot print	Level2(Understanding) Level3(Application), Level4(Analysing) Level5(Evaluation) Level6 (create)	4

CO-PO Mapping**1-Low, 2-Moderate, 3-High, ‘-‘ No Correlation**

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

ATTAINMENT OF POs

PROGRAM OUTCOMES ATTAINMENT									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	4.891429	2.445714	2.445714	2.445714	0	4.891429	2.445714	2.445714	7.337143
CO2	0	4.725143	2.362571	2.362571 1	0	4.725143	2.362571	4.725143	2.362571
CO3	2.362571	2.362571	2.362571	4.725143	4.725143	0	0	7.087714	4.725143
CO4	1.891429	1.891429	0	1.891429	1.891429	3.782857	1.891429	0	3.782857
CO 5	5.508	1.836	3.672	1.836	3.672	1.836	5.508	3.672	3.672
FINAL ATTAIN MENT	2.093347	2.21014 3	2.16857 1	2.21014 3	2.05771 4	2.17649	2.034619	2.241321	2.18797 1

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	7.337143	7.337143	2.445714	4.891429	4.891429
CO2	2.362571	2.362571	2.362571	4.725143	2.362571
CO3	4.725143	4.725143	2.362571	4.725143	2.362571
CO4	1.891429	1.891429	1.891429	3.782857	1.891429
CO 5	3.672	1.836	1.836	1.836	3.672
FINAL ATTAINMENT	2.220921	2.269036	2.179657	2.217841	2.168571

CLUSTER ELECTIVES

III B.Sc.: BOTANY SYLLABUS SEMESTER- VI

Paper VIII, CLUSTER ELECTIVE, Cluster-A, Paper VIII-A-1 : PLANT DIVERSITY AND HUMAN WELFARE

Unit- I: Plant diversity and its scope:

i. Genetic diversity, Species diversity, Plant diversity at the level ecosystem Agro biodiversity and cultivated plant taxa, wild taxa.

- a) Values and uses of biodiversity: Ethical and aesthetic
ii. values, Methodologies for valuation, Uses of plants.

Unit -II: Loss of biodiversity:

i. Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agro biodiversity, projected scenario for biodiversity loss

ii. Management of plant biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR;

Biodiversity legislation and conservations, Biodiversity information management and communication.

Unit-III: Contemporary practices in resource management:

- i. Environmental Impact Assessment (EIA), Geographical Information System GIS, Participatory resource appraisal, Ecological footprint with emphasis on carbon footprint, Resource accounting;
ii. Solid and liquid waste management

Unit -IV: Conservation of biodiversity

- i. Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation,
ii. Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.

Unit- V: Role of plants in relation to Human Welfare

Importance of forestry, their utilization and commercial aspects-

- a) Avenue trees, b) ornamental plants of India.
c) Alcoholic beverages through ages.
i. Fruits and nuts: Important fruit crops their commercial importance. Wood, fiber and their uses.

Semester-VI cluster-A2

Paper VIII-A-2 : ETHNOBOTANY AND MEDICINAL BOTANY

CO1:understand the significance of Medicinal plants

CO2: learn about the concepts of Ayurveda sidda traditional medicinal practice syatems

Co3:understand about different medicinal plants and their significance

Co4 understad the conept of Ttraditional knowledge and IPR

Co5: analyse the importance of botanical garden in bio diversity conservation

Learning Outcomes:On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1:understand the significance of Medicinal plants	Level1(Knowledge) Level2(Understanding) Level3(Application),	2
CO2: learn about the concepts of Ayurveda sidda	Level1(Knowledge) Level2(Understanding) Level4(Analysing) Level5(Evaluation)	3
Co3:understand about different medicinal plants and their significance	Level1(Knowledge), Level2(Understang) Level3(Application), Level4(Analysing)	2.5
Co4 understad the conept of Ttraditional knowledge and IPR	Level3(Application), Level4(Analysing) Level5(Evaluation)	4
Co5: analyse the importance of botanical garden in bio diversity conservation	Level2(Understanding) Level3(Application), Level4(Analysing) Level5(Evaluation) Level6 (create)	4

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	1	2	1	1	3
CO2	1	0	0	1	0	2	1	2	1
CO3	1	1	1	2	2	0	0	1	2
CO4	1	1	0	1	0	2	1	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	2	1	1	1
CO3	2	2	1	3	1	1
CO4	1	1	1	1	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	5.465046	0	2.732523	2.732523	2.732523	5.465046	2.732523	2.732523	8.197568
CO2	2.598784	0	0	2.598784	0	5.197568	2.598784	5.197568	2.598784
CO3	2.665653	2.665653	2.665653	5.331307	5.331307	0	0	2.665653	5.331307
CO4	2.465046	2.465046	0	2.465046	0	4.930091	2.465046	2.465046	4.930091
CO 5	7.314894	4.876596	4.876596	4.876596	4.876596	4.876596	7.314894	4.876596	4.876596
FINAL ATTAINMENT	2.563678	2.501824	2.568693	2.572036	2.588085	2.558663	2.518541	2.562484	2.593435

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	8.197568	8.197568	2.732523	5.465046	5.465046
CO2	2.598784	5.197568	5.197568	2.598784	2.598784
CO3	5.331307	5.331307	2.665653	7.99696	2.665653
CO4	2.465046	2.465046	2.465046	2.465046	2.465046
CO 5	4.876596	2.438298	2.438298	2.438298	2.438298
FINAL ATTAINMENT	2.6077	2.625532	2.583181	2.620517	2.605471

III B. Sc - BOTANY SYLLABUS SEMESTER- VIII : CLUSTER ELECTIVE -A

Paper VIII-A-2 : ETHNOBOTANY AND MEDICINAL BOTANY

Unit –I:Ethnobotany

- i. Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context
- ii. Major and minor ethnic groups or Tribals of India, and their lifestyles.
- iii. Plants used by the tribal populations: a) Food plants, b) intoxicants and beverages, c) Resins and oils and miscellaneous uses.

Unit -II: Role of ethnobotany in modern Medicine:

- i. Role of ethnobotany in modern medicine with special example
Rauwolfia serpentina, Trichopus zeylanicus, Artemisia annua, Withania somnifera.
- ii. Medico-ethnobotanical sources in India
- iii. Significance of the following plants in ethnobotanical practices (along with their habitat and morphology)
a) *Azadirachta indica*, b) *Ocimum sanctum*, c) *Vitex negundo*,
d) *Gloriosa superba*, e) *Tribulus terrestris*, f) *Phyllanthus niruri*,
g) *Cassia auriculata*, h) *Indigofera tinctoria*, i) *Senna auriculata*, j) *Curcuma longa*
- iv. Role of ethnic groups in the conservation of plant genetic resource

Unit-III: Ethnobotany as a tool to protect interests of ethnic

- i. Sharing of wealth concept with few examples from India.
Biopiracy, Intellectual Property Rights and Traditional Knowledge.

Unit -IV: History, Scope and Importance of Medicinal Plants. indigenous Medicinal Sciences

- i. Definition and Scope - **Ayurveda**: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments.
- ii. **Siddha**: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.
- iii. **Unani**: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations (in brief).

Unit -V: Conservation of endangered and endemic medicinal plants:

- i. Definition: endemic and endangered medicinal plants,
- ii. Red list criteria
- iii. *In situ* conservation: Biosphere reserves, sacred groves, National Parks
- iv. *Ex situ* conservation: Botanical Gardens.

Semester-VI cluster-A3

Paper VIII-A-3: Pharmacognosy and Phytochemistry

CO1:understand the significance of secondary metabolites

CO2: learn about the Drug evaluation methods

Co3:understand about different medicinal plants and their significance

Co4 : learn about Different groups of Alkaloids, biosynthesis, bioactivity.

Co5: analyse the Pharmacological action of plant drugs – tumor inhibitors,PAF antagonists, antioxidants

Learning Outcomes:On Completion of the course, the students will be able to	Knowledge level (Bloom's Taxonomy)	Average level weightage
CO1:understand the significance of secondary metabolites	Level1(Knowledge) Level2(Understanding)	1.5
CO2: learn about the Drug evaluation methods	Level1(Knowledge) Level2(Understanding) Level4(Analysing) Level5(Evaluation)	3
Co3:understand about different medicinal plants and their significance	Level2(Understang) Level3(Application), Level4(Analysing)	3
Co4 : learn about Different groups of Alkaloids, biosynthesis, bioactivity.	Level3(Application), Level4(Analysing) Level5(Evaluation)	4
Co5: analyse the Pharmacological action of plant drugs – tumor inhibitors,PAF antagonists, antioxidants	Level2(Understanding) Level3(Application), Level4(Analysing) Level5(Evaluation) Level6 (create)	4

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	1	2	1	1	3
CO2	0	1	2	1	0	2	1	2	1
CO3	1	1	0	2	2	0	0	1	2
CO4	1	1	2	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	3	1	1
CO5	2	1	1	1	2	3

ATTAINMENT OF POs

PROGRAM OUTCOMES ATTAINMENT									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	5.271	0	2.6355	2.6355	2.6355	5.271	2.6355	2.6355	7.9065
CO2	0	2.271	4.542	2.271	0	4.542	2.271	4.542	2.271
CO3	2.271	2.271	0	4.542	4.542	0	0	2.271	4.542
CO4	2.028	2.028	4.056	2.028	2.028	4.056	2.028	0	4.056
CO 5	5.9382	3.9588	3.9588	3.9588	3.9588	3.9588	5.9382	3.9588	3.9588
FINAL ATTAIN MENT	2.215457	2.10576	2.17032 9	2.20504 3	2.19405	2.22847 5	2.14545	2.23455	2.27343

ATTAINMENT OF PSOs

PROGRAM SPECIFIC OUTCOMES ATTAINMENT					
	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	7.9065	7.9065	2.6355	5.271	5.271
CO2	2.271	4.542	2.271	4.542	4.542
CO3	4.542	2.271	2.271	6.813	2.271
CO4	2.028	2.028	2.028	6.084	2.028
CO 5	3.9588	1.9794	1.9794	1.9794	3.9588
FINAL ATTAINMENT	2.3007	2.340863	2.23698	2.244491	2.25885

III B. Sc - BOTANY SYLLABUS
SEMESTER- VIII CLUSTER
ELECTIVE, Paper VIII-A-3

Paper VIII-A-3: Pharmacognosy and Phytochemistry

Unit-I: Pharmacognosy

Definition, Importance, Classification of drugs -
Chemical and Pharmacological, Drug evaluation
methods

Unit –II: Organoleptic and microscopic studies:

Organoleptic and microscopic studies with reference to nature of
active principles and common adulterants

Adhatodavasisica(leaf), *Strychnosnuxvomica*(seed), *Rauwolfiaserpentina*(root) and

Zinziberofficinalis Catharanth us roseus.

Unit-III: Secondary Metabolites:

- i. Definition of primary and secondary metabolites and their differences, major types
- terpenes, phenolics, alkaloids, terpenoids, steroids.
- ii. A brief idea about extraction of alkaloids. Origin of secondary
metabolites – detailed account of acetate pathway, mevalonate pathway,
shikimate pathway.

UNIT-IV: Phytochemistry:

Biosynthesis and sources of drugs:

- (i) Phenols and phenolic glycosides : structural types, biosynthesis,
importance of simple phenolic compounds, tannins, anthraquinones,
coumarins and furanocoumarins, flavones and related flavonoid
glycosides, anthocyanins, betacyanins, stilbenes, lignins and lignans).
- (ii) Steroids, sterols, saponins, withanolides, ecdysones, cucurbitacins:
- (iii) Alkaloids: Different groups, biosynthesis, bioactivity.
- (v) Volatile oils, aromatherapy.

UNIT-V: Enzymes, proteins and amino acids as drugs:

- i. Vaccines, toxins and toxoids, antitoxins, immune globulins, antisera,
- ii. Vitamins, Antibiotics – chemical nature, mode of action.
- iii. Pharmacological action of plant drugs – tumor
inhibitors, PAF antagonists, antioxidants, phytoestrogen and others.
- iv. Role of different enzyme inhibitors.