

John Wilson Education Society's

Wilson College (Autonomous)

Chowpatty, Mumbai - 400007

RE-ACCREDITED

'A' Grade by NAAC

Affiliated to the

UNIVERSITY OF MUMBAI

Syllabus for T.Y.

(Under Autonomy)

Program: B. Sc - BOTANY

Program Code: WUSBOT

Choice Based Credit System (CBCS)

w.e.f Academic year: 2024–2025

**Wilson College
(Autonomous)
Department of Botany**

**Proposed T. Y. B. Sc. (Autonomy) Syllabus
(To be implemented from the Academic year 2024-25)**

Program: B.Sc.

Program Objectives (POs)

- PO1. To consolidate the disciplinary knowledge through classroom and field studies.
- PO2. To enhance critical thinking skills via written assignments, essay and review writing.
- PO3. To upgrade communication skills and self-directed learning via curricular, co-curricular and extra-curricular activities.
- PO4. To promote employability and entrepreneurship skills by providing hands-on training.
- PO5. To endeavor towards holistic development of the learners.

Program Specific Outcomes (PSOs)

The Learners (Graduates) will be able to -

- PSO1. Apply the knowledge acquired for exploring different facets of plant sciences.
- PSO2. Address environment related issues/concerns.
- PSO3. Apply the principles and practice the techniques learnt in routine and professional life.
- PSO4. Analyze information/data and use statistical tools to arrive at a judicious conclusion.
- PSO5. Use knowledge of plant sciences for personal, professional, environmental and societal benefits.
- PSO6. Develop an aptitude towards research in plant sciences and allied fields.

PROGRAM OUTLINE 2024-2025

SEM	COURSE CODE	COURSE TITLE	Credits
V	WUSBOT501	Plant Diversity - III	3
	WUSBOT502	Plant Diversity - IV	3
	WUSBOT503	Form and Function - III	3
	WUSBOT504	Current Trends in Plant Science - II	3
	WUSBOT5P1	Botany Practical-5	4
	WUSBOT5P2	Botany Practical- 6	4
	WUSBOT505	Applied Component (Horticulture and Gardening-I)	3
	WUSBOT5P3	Applied Component Practical (Horticulture and Gardening-I)	2
VI	WUSBOT601	Plant Diversity - III	3
	WUSBOT602	Plant Diversity - IV	3
	WUSBOT603	Form & Function - III	3
	WUSBOT604	Current Trends in Plant Science - II	3
	WUSBOT6P1	Botany Practical-7	4

	WUSBOT6P2	Botany Practical- 8	4
	WUSBOT605	Applied Component (Horticulture and Gardening-II)	3
	WUSBOT6P3	Applied Component Practical (Horticulture and Gardening-II)	2

**SEMESTER V
THEORY**

PROGRAM(s): T.Y.B.Sc.				SEMESTER: V	
Course: Plant Diversity III				Course Code: WUSBOT501	
Teaching Scheme				Evaluation Scheme	
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	NA	3	40	60
Learning Objectives					
The specific objectives of this course are to expose learners to the following topics:					
<ol style="list-style-type: none"> 1. To study the microbial world and culturing techniques of microbes. 2. To study the general characteristics of Algae and Fungi and their economic values. 3. To study the different diseases in plants and their possible control measures. 					
Course outcomes					
Learners will be able to:					
CO1- Gain knowledge about microbial diversity.					
CO2- Understand techniques for culturing and visualization.					
CO3- Understand the salient features of three major groups of algae and their life cycle patterns.					
CO4- Identify the three major groups of algae.					
CO5- Learn the general characteristics and classification of two major groups of fungi along with life cycles.					
CO6- Identify the two major groups of fungi.					
CO7- Understand the scope and importance of Plant pathology.					
CO8- Apply the concepts of various control measures of commonly widespread plant diseases.					

Course Title	PLANT DIVERSITY III		3 Credits (60 lectures)
Course Code	WUSBOT501		
Unit I	Microbiology		15 Lectures
	1.1	Types of Microbes: Viruses, Bacteria, Algae, Fungi, Protozoa, Mycoplasma and Actinomycetes.	
	1.2	Culturing: Sterilization, media, staining, colony characters.	
	1.3	Pure culture Techniques	
Unit II	Algae (G.M. Smith Classification System to be followed)		15 Lectures
	2.1	<i>Divisions- Rhodophyta, Xanthophyta and Bacillariophyta:</i> Occurrence, classifications and general characters- Cell structure, pigments, reserve food, asexual and sexual reproduction, alternation of generation and economic importance.	
	2.2	Structure, life-cycles and systematic position of <i>Batrachospermum, Polysiphonia, Vaucheria</i> and <i>Navicula</i> .	
Unit III	Fungi (G.M. Smith Classification System to be followed)		15 Lectures
	3.1	Basidiomycetes: Classification and General characters <ul style="list-style-type: none"> • Life cycle of <i>Agaricus</i> • Life cycle of <i>Puccinia</i> 	
	3.2	Deuteromycetae: Classification and General Characters	
	3.3	Life cycle of <i>Alternaria</i>	
	Plant Pathology		

Unit IV	4.1	Study of Plant Diseases- Causative organisms, symptoms, predisposing factors, disease cycle and control measures of the following <ol style="list-style-type: none"> 1. White rust- <i>Albugo candida</i> 2. Tikka disease of groundnut: <i>Cercospora</i> 3. Damping off disease: <i>Pythium</i> 4. Citrus Canker: <i>Xanthomonas axonopodis</i> pv. Citri 5. Leaf Curl: Leaf curl virus in Papaya 	15 Lectures
	4.2	Study of physical, chemical and biological control methods of plant diseases	

PROGRAM(s): T. Y. B. Sc			SEMESTER: V		
Course: Plant Diversity- IV			Course Code: WUSBOT502		
Teaching Scheme					Evaluation Scheme
Lectures (Hours perweek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60
Learning Objectives					
The specific objectives of this course are to expose learners to the following topics: <ol style="list-style-type: none"> 1. To learn the morphology and functions of fossil plants. 2. To learn the systematic position and taxonomy of angiosperms. 3. To learn the detailed internal structure of dicot and monocot plants. 4. To study the morphology and applied aspect of pollens. 					

Course Outcomes

Learners will be able to:

- CO1-Acquire knowledge of different fossil forms.
- CO2- Understand different fossils w.r.t its role in evolution.
- CO3- Explain different parts of flowers and their modifications.
- CO4 -Describe and distinguish the morphological characters while studying the plant families.
- CO5-Evaluate the current trends in taxonomy
- CO6- Relate anomalies in internal stem structure with function and appreciate the salient features of the root stem transition zone.
- CO7-Get exposure to pollen study and learn to apply it in various fields.
- CO8- Acquire knowledge of different allergies w.r.t. pollens.

Course Title	Plant Diversity- IV		3 Credits (60 Lectures)
Course Code	WUSBOT502		
Unit I	Paleobotany		15 Lectures
	1.1	<i>Lepidodendron</i> – All form genera root, stem, bark, leaf, male and female fructification.	
	1.2	<i>Lyginopteris</i> – All form genera root, stem, leaf, male and female fructification.	
	1.3	<i>Pentoxylon</i> – All form genera.	
	1.4	Contribution of Prof Birbal Sahni, Birbal Sahni Institute of Paleobotany, Lucknow	
Unit II	Unit II: Angiosperms I		15 Lectures
	2.1	Morphology of flower – All Parts of Flower.	
	2.2	Complete classification of Bentham and Hooker (only for prescribed families), Merits and demerits	
	2.3	Bentham and Hooker’s system of classification for flowering plants up to family with respect to the following prescribed families and economic and medicinal importance for members of the families. (Special stress on fruit morphology to be given)	

		<ul style="list-style-type: none"> • Brassicaceae (Cruciferae) • Umbelliferae • Cucurbitaceae • Rubiaceae • Solanaceae • Poaceae (Graminae) 	
	2.4	Current Trends in Plant Taxonomy	
Unit III	Anatomy I		
	3.1	Types and reasons of anomalous secondary growth	15 Lectures
	3.2	Anomalous secondary growth in the Stems of <i>Bignonia</i> , <i>Salvadora</i> , <i>Achyranthes</i> , <i>Dracaena</i> . Storage roots of Beet, Radish	
	3.3	Root stem transition	
	3.4	Types of Stomata– Anomocytic, Anisocytic, Diacytic, Paracytic, and Graminaceous	
Unit- IV	Palynology		
	4.1	Pollen Morphology	15 Lectures
	4.2	Pollen viability- storage	
	4.3	Germination and growth of Pollen	
	4.4	Application of Palynology in honey industry, coal and oil exploration, Aeropalynology and pollen allergies, forensic science	

PROGRAM(s): T.Y. B. Sc		SEMESTER: V			
Course: Form and Function III			Course Code: WUSBOT503		
Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60
<p>Learning Objectives: The specific objectives of this course are to expose learners to the following topics:</p> <ol style="list-style-type: none"> 1. To study the cellular and molecular biology of cell organelles. 2. To study the physiology and metabolism of plants. 3. To make students aware with the significant environmental topics like, bioremediation, phytoremediation etc 4. To enrich students with in-depth understanding on ecological succession and the associated concepts 5. To introduce the concept of Environmental Impact Assessment 6. To study the technique of growing plants in aseptic condition and its application in agriculture. 					
<p>Course Outcomes:</p> <p>Learners will be able to:</p> <p>CO1-Acquire knowledge about two important organelles. CO2- Understand the molecular mechanisms of translation. CO3- Understand the process of respiration in plants and how environmental factors affect it. CO4- Explain about bio and phytoremediation, its principles and types. CO5- Compare seral stages, types of succession and climax. CO6- Evaluate the concept of Environmental Impact Assessment. CO7- Exposure to principles and techniques of plant tissue culture. CO8- Apply techniques for improving agriculture and horticulture and to become an entrepreneur.</p>					

Course Title	Form and Function III		3 Credits (60 lectures)
Course Code	WUSBOT503		
Unit I	Cytology and Molecular Biology		
	1.1	Structure and function of nucleus	15 Lectures
	1.2	Structure and function of endoplasmic reticulum	
	1.3	Structure and function of giant chromosomes	
	1.4	The genetic code: Characteristics of the genetic code	
	1.5	Translation in Prokaryotes and Eukaryotes.	
Unit II	Plant Physiology I		
	2.1	Respiration (Carbon Oxidation): Introduction and types of respiration, glycolysis, oxidation of pyruvic acid, TCA cycle, mitochondrial electron transport system, oxidative phosphorylation and factors affecting respiration.	15 Lectures
Unit III	Environmental Botany		
	3.1	Bioremediation: Principles, factors controlling bioremediation, types of bioremediation, and microbial population in bioremediation.	15 Lectures
	3.2	Phytoremediation: w.r.t. heavy metals, persistent organic pollutants	
	3.3	Plant succession: Hydrosere and Xerosere –Recap Seres -importance Primary and Secondary Succession Concept of climax Mono and Poly Climax theories	
	3.4	Environmental Impact Assessment	
Unit IV	4.1	Plant Tissue Culture	15 Lectures

Course Title	Form and Function III		3 Credits (60 lectures)
Course Code	WUSBOT503		
	4.2	Aspects of Micro-propagation with reference to Floriculture: Detailed study of Orchid Cultivation	
	4.3	Plant cell suspension cultures for the production of secondary metabolites: With special reference to Shikonin production.	
	4.4	Somatic Embryogenesis and Artificial Seeds.	
		Protoplast Fusion and Somatic Hybridization: Concept, Definition, and various methods of Protoplast Fusion Applications of Somatic Hybridization in Agriculture	

PROGRAM(s): T.Y. B. Sc		SEMESTER: V			
Course: CURRENT TRENDS IN PLANT SCIENCES II			Course Code: WUSBOT504		
Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60
<p>Learning Objectives: The specific objectives of this course are to expose learners to the following topics:</p> <ol style="list-style-type: none"> 1. To study traditional medicines and their effects in different ailments. 2. To study genomic DNA and its extraction techniques. 3. To study different techniques in the estimation/separation of ions and solutes in plants. 4. To study the morphology, chemical constituents and applications of some selected medicinal plants 					

Course Outcomes:**Learners will be able to:**

CO1-Get exposure to the technique of mushroom cultivation and explore the possibility of entrepreneurship in the same.

CO2-Learn ethnobotanical principles and applications.

CO3- Utilize indigenous plant knowledge for the cure of common human diseases and improvement of agriculture.

CO4-Gain knowledge about the latest molecular biology techniques for isolation and characterization of genes.

CO5- Understand the techniques of marking DNA by suitable probe.

CO6-Learn principles and application of commonly used techniques in instrumentation.

CO7-Gain proficiency in the monograph study.

CO8- Understand pharmacognostic analysis of six medicinal plants.

Course Title	CURRENT TRENDS IN PLANT SCIENCES II		3 Credits (60 lectures)
Course Code	WUSBOT504		
Unit I	Ethnobotany and Mushroom Industry		
	1.1	Ethnobotany- Definition, history, sources of data and methods of study.	15 Lectures
	1.2	Applications of ethnobotany: <ul style="list-style-type: none"> • Ethno-medicines. • Agriculture. • Edible plants. 	
	1.3	Traditional medicines used by tribals in Maharashtra towards <ul style="list-style-type: none"> • Skin ailments: <i>Rubia cordifolia</i>, <i>Sandalwood</i> • Liver ailments: <i>Phyllanthus</i>, <i>Andrographis</i> • Wound healing and ageing: <i>Centella</i>, <i>Typha</i>, <i>Terminalia</i>, <i>Tridax</i>. • Fever: <i>Vitex negundo</i>, <i>Tinospora cordifolia</i> leaves Diabetes: <i>Momordica charantia</i>, <i>Syzygium cuminii</i> 	
	1.4	Mushroom industry: <ul style="list-style-type: none"> • Detailed general account of production of mushrooms with respect to methods of Composting, spawning, casing, harvesting of mushroom. Cultivation of <i>Pleurotus</i>, <i>Agaricus</i>, <i>Volvariella</i> mushroom. • General account of mushrooms: Nutritional 	

		value, picking and packaging, economic importance.	
Unit II	Plant Biotechnology I		
	2.1	Construction of genomic DNA libraries, Chromosome libraries and c- DNA libraries.	15 Lectures
	2.2	Identification of specific cloned sequences in c-DNA libraries and Genomic libraries	
	2.3	Analysis of genes and gene transcripts- Restriction enzyme, analysis of cloned DNA sequences. Hybridization (Southern Hybridization)	
Unit III	Instrumentation		
	3.1	Colorimetry and Spectrophotometry (Visible, UV and IR) – Instrumentation, working, principle and applications.	15 Lectures
	3.2	Chromatography: General account of Column chromatography. Principle and bedding material involved in adsorption and partition chromatography, ion exchange chromatography, molecular sieve chromatography.	
Unit- IV	Pharmacognosy and Medicinal Botany		15 Lectures
	4.1	Monographs of drugs with reference to biological sources, geographical distribution, common varieties, macro and microscopic characters, chemical constituents, therapeutic uses, adulterants- <ul style="list-style-type: none"> • <i>Strychnos</i> seeds • <i>Senna</i> leaves • Clove buds • <i>Allium sativum</i> • <i>Acorus calamus</i> • <i>Curcuma longa</i> 	

**SEMESTER V
PRACTICAL**

PROGRAM(s): T.Y. B. Sc				SEMESTER: V	
Course: Botany Practical 5				Course Code: WUSBOT5P1	
Teaching Scheme				Evaluation Scheme	
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
-	6.4	-	4	40	60
Semester V- WUSBOT5P1 – For 6 Units					Credit 2
PRACTICAL PAPER I–PLANT DIVERSITY III – WUSBOT 5P1 (For 6 Units)					
Microbiology <ul style="list-style-type: none"> Study of aeromicrobiota by Petri Plate exposed method: Fungal culture, Bacterial culture. Determination of Minimum Inhibitory Concentration (MIC) of sucrose against selected microorganism. Study of antimicrobial activity by the disc diffusion method. 					
Algae (G.M. Smith Classification System to be followed) <ul style="list-style-type: none"> Study of stages in the life cycle of the following Algae from fresh / preserved material and permanent slides. <ul style="list-style-type: none"> <i>Polysiphonia</i> <i>Batrachospermum</i> <i>Vaucheria</i> <i>Navicula</i>. 					
Fungi (G.M. Smith Classification System to be followed) <ul style="list-style-type: none"> Study of stages in the life cycle of the following Fungi from fresh / preserved material and permanent slides <ul style="list-style-type: none"> <i>Agaricus</i> <i>Puccinia</i> <i>Alternaria</i> 					
Plant Pathology <ul style="list-style-type: none"> Study of the following fungal diseases: <ul style="list-style-type: none"> White rust in Cruciferae (Brassicaceae) Tikka disease in Groundnut Damping off disease Citrus canker Leaf curl in <i>Papaya Leaf</i> 					

Semester V USBOP7 – For 3 Units	
PRACTICAL PAPER II–PLANT DIVERSITY IV WUSBOTP 5P2 (For 3 & 6 Units)	Credit 2
Paleobotany <ul style="list-style-type: none"> • Study of the following form genera with the help of permanent slides/ photomicrographs. <ul style="list-style-type: none"> • <i>Lepidodendron</i> • <i>Lyginopteris</i> • <i>Pentoxylon</i> 	
Angiosperms I <ul style="list-style-type: none"> • Morphology of Flower – All Parts of Flower • Study of one plant from each of the following Angiosperm families as per Bentham and Hooker’s system of classification. <ul style="list-style-type: none"> • Brassicaceae (Cruciferae) • Umbelliferae • Cucurbitaceae 	
<ul style="list-style-type: none"> • Rubiaceae • Solanaceae • Poaceae (Graminae) • Morphological peculiarities and economic importance of the members of the above-mentioned Angiosperm families • Identifying the genus and species of a plant with the help of Flora 	
Anatomy I <ul style="list-style-type: none"> • Study of anomalous secondary growth in the stems of the following plants using double staining technique. <ol style="list-style-type: none"> 1. <i>Bignonia</i> 2. <i>Salvadora</i> 3. <i>Achyranthes</i> 4. <i>Dracaena</i> • Study of anomalous secondary growth in the roots of <ol style="list-style-type: none"> 1. Beet 2. Radish • Types of Stomata <ol style="list-style-type: none"> 1. Anomocytic 2. Anisocytic 3. Diacytic 4. Paracytic 5. Graminaceous 	

Palynology I

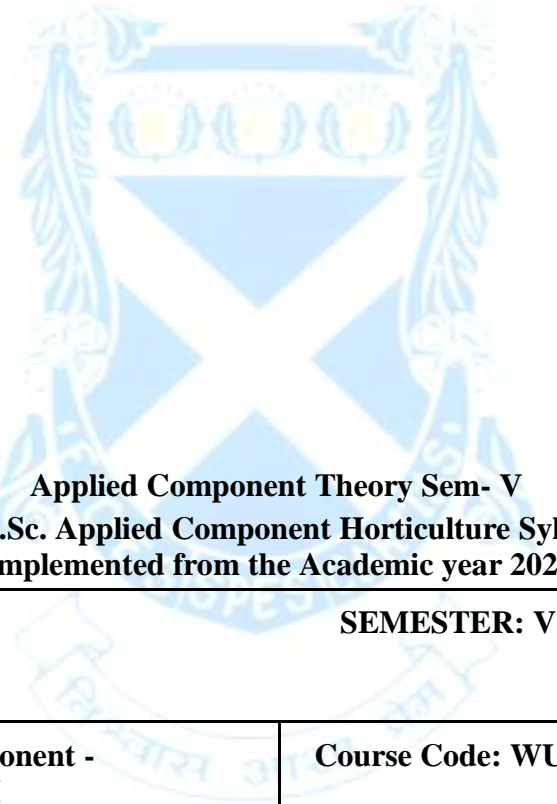
- Study of pollen morphology (NPC Analysis) of the following by Chitale's Method
 - *Hibiscus*
 - *Datura*
 - *Ocimum*
 - *Crinum*
 - *Pancreatium*
 - *Canna*
- Determination of pollen viability
- Pollen analysis from honey sample – unifloral and multifloral honey
- Effect of varying concentration of sucrose on *In vitro* Pollen germination

PROGRAM(s): T.Y. B. Sc			SEMESTER: V		
Course: Botany Practical 6			Course Code: WUSBOT5P2		
Teaching Scheme			Evaluation Scheme		
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
-	6.4	-	4	40	60
Semester V WUSBOT6 – For 6 Units Semester V USBOP7 – For 3 Units					Credit
PRACTICAL –PAPER III FORM AND FUNCTION III USBOP 503 (For 3 & 6 Units)					2
Cytology and Molecular Biology <ul style="list-style-type: none"> • Mounting of Giant chromosomes from <i>Chironomous</i> larva • Smear preparation from <i>Tradescantia</i> buds • Predicting the sequence of amino acids in the polypeptide chain that will be formed following translation (Eukaryotic) 					

<p>Plant Physiology I</p> <ul style="list-style-type: none"> • Estimation of Phosphate phosphorus (Plant acid extract) • Estimation of Iron (Plant acid extract) <p>Note: Preparation of a standard graph and determination of the multiplication factor for Phosphate / Iron estimation using a given standard phosphate / Standard Iron solution should be done in regular practical as this will also be put as a question in practical exam</p>	
<p>Environmental Botany</p> <ul style="list-style-type: none"> • Estimation of the following in given water sample <ul style="list-style-type: none"> • Dissolved oxygen demand • Biological oxygen demand • Hardness • Salinity and Chlorinity 	
<p>Micropropagation</p> <ul style="list-style-type: none"> • Plant Tissue culture: • Identification – Multiple shoot culture, hairy root culture, somatic embryogenesis • Preparation of stock solutions for preparation of MS medium <p>(Note: Concept of preparation of specified molar solutions should be taught and problems based on preparation of stock solutions for tissue culture media will be given).</p>	
<p>Semester V WUSBOTP6 – For 6 Units</p>	
<p>PRACTICAL – PAPER IV CURRENT TRENDS IN PLANT SCIENCES II USBOP 504 (For 6 Units)</p>	Credit 2
<p>Ethnobotany and mushroom industry</p> <ul style="list-style-type: none"> • Study of plants mentioned in theory for Ethnobotany • Mushroom cultivation (To be demonstrated) • Identification of various stages involved in mushroom cultivation – spawn, pin head stage, mature/ harvest stage of <i>Agaricus</i>, <i>Pleurotus</i>, <i>Volvariella</i> 	
<p>Biotechnology I</p> <ul style="list-style-type: none"> • Growth curve of <i>E. coli</i> • Plasmid DNA isolation and Separation of DNA using AGE • Restriction mapping (problems), Southern blotting 	
<p>Instrumentation</p> <ul style="list-style-type: none"> • Demonstration of Beer Lambert’s Law • Experiment based on ion exchange chromatography for demonstration • Experiment based on separation of dyes/ plant pigments using silica gel column. 	

Pharmacognosy

- Macroscopic/ Microscopic characters and Chemical tests for active constituents of the following plants.
 - *Allium sativum*
 - *Acorus calamus*
 - *Curcuma longa*
 - *Senna angustifolia*
 - *Strychnos nux-vomica*
 - *Eugenia caryophyllata*



Applied Component Theory Sem- V
T.Y.B.Sc. Applied Component Horticulture Syllabus
To be implemented from the Academic year 2024-2025

PROGRAM(s): T.Y. B. Sc				SEMESTER: V	
Course: Botany Applied Component - Horticulture and Gardening –I				Course Code: WUSBOT505	
Teaching Scheme				Evaluation Scheme	
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
4	-	-	3	40	60

Learning Objectives: The objectives of the course are -

1. To enrich the students with in-depth knowledge of the branches of horticulture.
2. To expose the students to the contributions of the eminent horticultural institutions and schemes
3. To make students aware various methods of propagation - natural, artificial and modern methods
4. To furnish the enriched information on manures, fertilizers, biofertilizers, pests, diseases, friends of farmers etc.
5. To make students acquainted with the knowledge and importance of various garden and horticultural operations and principles of organic farming

Course Outcomes: The learners will be able to -

1. Explain various branches of horticulture
2. Summarise the significance or contributions of various institutions and schemes related to Horticulture
3. Describe and differentiate various methods of plant propagation - natural, artificial and modern propagation
4. Illustrate on the nature and roles of Manures, Fertilizers, Biofertilizers, Pests, Diseases, Friends of farmers etc
5. Discuss on the importance of different operations involved in gardening and Horticulture
6. Criticise on the water management in dryland Horticulture and practices of organic farming

Course Title	Horticulture and Gardening –I		3 Credits (60 lectures)
Course Code	WUSBOT505		
Unit I	INTRODUCTION TO HORTICULTURE		
	1.1	Definition, history, importance and objectives of Horticulture. Main branches of Horticulture - Pomology, Olericulture, Floriculture, Landscape Gardening, Ornamental Horticulture	15 Lectures
	1.2	Allied branches of Horticulture - Horticulture Nursery, Apiculture - special emphasis on pollination, Social Forestry w.r.t. horticulture and Horticulture exhibitions	
	1.3	Important Horticulture Research Institutes and Government Schemes for strategy plantations <ul style="list-style-type: none"> ● Konkan Krishi Vidyapeeth – Dapoli ● Regional Fruit Research Centre, Aundh Pune 	

		<ul style="list-style-type: none"> ● Horticulture Training Centre (H.T.C.) – Talegaon. 	
	1.4	National Horticulture Board (NHB) and National Horticulture Mission (NHM)	
	1.5	Strategy Plantation – Lakhibaug Scheme	
Unit II	PROPAGATION PRACTICES		
	2.1	Sexual Propagation (by Seeds) Introduction, advantages and disadvantages of sexual propagation, production of seeds, storage of seeds, seed treatments, sowing (types of seeding), environmental factors affecting seed germination, transplanting of seedlings, seedling diseases and their control.	15 Lectures
	2.2	By specialized Vegetative structures - natural ways Bulbs, Tubers, Corms, Rhizomes, Root stock, runners, Offsets and suckers.	
	2.3	Artificial methods of plant propagation <ul style="list-style-type: none"> ● Cutting– Root cutting, Stem cutting, and leaf cutting. Use of PGR's for rooting. ● Layering – Definition, Types: Simple, Compound, Tip, Trench, Mound, Air Layering. ● Grafting-Definition, advantages and disadvantages. Types: Splice, whip/ tongue, side,cleft, bark, approach, repair grafting –inarching and bridge ● Budding – Definition, advantages and disadvantages. Types: T-budding, shield and patch budding 	
	2.4	Propagation by Tissue Culture Techniques (PTC) - general account and importance of PTC in Horticulture	
Unit III	MAURES, FERTILIZERS, PLANT DISEASES, PESTS and FRIENDS OF FARMERS		
	3.1	Manures: Definition, importance, important manures FYM(compost), oil cakes, green manure, organic manures and vermicompost.	15 Lectures
	3.2	Fertilizers: Definition, Types – Straight, Compound and mixed. Nitrogenous - (NH ₄) ₂ SO ₄ , Urea, Ca (NO ₃) ₂ , NH ₄ Cl,	

		Phosphatic - (Superphosphate, Bone meal), Potassic - (Muriate of potash, K ₂ SO ₄)	
	3.3	Biofertilizers: Bacteria, Cyanobacteria, Mycorrhiza, Sea Weeds.	
	3.4	Diseases: Horticultural plant diseases and their control. Fungal diseases- Rust, Smut, Powdery Mildew. Bacterial – Citrus Canker, Bacterial wilt. Viral – TMV, Leaf curl.	
	3.5	Pests – Common insect pests on horticultural crops -Aphids, Beetle, Stem borer and Caterpillars Non-insect pests - Rodents, Snails, Nematodes	
	3.6	Friends of farmers: Earthworm, Snakes and Predaceous Fungi.	
Unit- IV		IMPORTANT GARDEN OPERATIONS w.r.t. HORTICULTURE	
	4.1	Selection of site, Preparation of soils for garden	
	4.2	Mulching, top- dressing, blanching	
	4.3	Sowing, transplanting, tree transplanting,	
	4.4	Irrigation, - Traditional and modern methods	
	4.5	Weeding and pruning, - Principles, Objectives and general technique	
	4.6	Water management and conservation w.r.t. Dry land Horticulture.	
	4.7	Organic Farming Definition, Scope, Indian scenario, Future scope	

Applied Component Practical Sem- V
T.Y.B.Sc. Applied Component Horticulture Syllabus
To be implemented from the Academic year 2024-2025

PROGRAM(s): T.Y. B. Sc		SEMESTER: V			
Course: Applied Component Practical - Horticulture and Gardening -1			Course Code: WUSBOT5P3		
Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
-	3.2	-	2	40	60

Semester V Code -WUSBOT5P3 – For 6 Units Semester	Credit 2
PRACTICAL - APPLIED COMPONENT (AC) - HORTICULTURE AND GARDENING	
Garden implements and their uses.	
Different types of pots & Potting media, Potting and Reporting	
Propagation practices by seed, Vegetative propagation - cutting, layering, budding, grafting .	
Identification of Fertilizers –Identification by physical and chemical methods – Urea , Potassium sulphate, Single Super Phosphate .	
Manures – Identification of plants as green manure – <i>Gliricidia and Leucaena</i>	
Biofertilizers – Identification (material/slides) VAM, <i>Nostoc ,Rhizobium</i> .	
Soil and water Testing - Soil and Water pH, Organic Carbon of soil.	
Preparation of Bonsai, Bottle Garden/Terrarium, Hanging baskets, Dish garden.	

Diseases and pests: <ul style="list-style-type: none"> ● Fungal – Powdery mildew ,Rust ,Wilt, Blight, Smut, ● Bacterial – Canker ,Wilt ● Viral – Leaf curl ,yellow vein Mosaic ● Insects – Sucking, Biting, Chewing, Borers & Ants . ● Non Insects pests- Nematodes, Rodents and Snails 	
Preparation of natural insecticides – Neem Arka , Dashparni Arka, Seetaphal powder, Tobacco Extracts .	
2 Visits : To Garden /Parks / Nurseries/ Exhibition / Horticulture Industries / Research Station and record of visits should be duly certified and presented at practical examination.	
Project – Each student should individually present a project related to any topic related to Horticulture. It should be duly certified and presented at practical examination. Project presentation at college level is compulsory.	

SEMESTER VI

PROGRAM(s): T.Y. B. Sc			SEMESTER: VI		
Course: PLANT DIVERSITY III			Course Code: WUSBOT601		
Teaching Scheme			Evaluation Scheme		
Lectures (Hours perweek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60
Learning Objectives: The specific objectives of this course are to expose learners to the following topics: <ol style="list-style-type: none"> 1. To study the morphology and life cycle of Bryophytes/Pteridophytes. 2. To study the applied aspect of Bryophytes/Pteridophytes. 3. To study the morphology, life cycle and economic importance of Gymnosperms. 					

Course Outcomes:**Learners will be able to:**

CO1-Identify and describe three Bryophytes.

CO2- Understand the life cycles of three Bryophytes.

CO3-Acquire detailed classification and general characters of three classes of Pteridophytes.

CO4- Identify as well as describe the life cycles of Pteridophytes.

CO5- Understand the economic utilization of Bryophytes and Pteridophytes.

CO6-Understand evolutionary aspects of Bryophytes and Pteridophytes.

CO7 -Identify and describe the Gymnosperms

CO8- Understand the life cycles of three Gymnosperms.

Course Title	PLANT DIVERSITY III		3 Credits (60 lectures)
Course Code	WUSBOT601		
Unit I	Bryophyta (G. M. Smith Classification system to be followed)		
	1.1	Life cycle of <i>Marchantia</i>	15 Lectures
	1.2	Life cycle of <i>Pelia</i>	
	1.3	Life cycle of <i>Sphagnum</i>	
Unit II	Pteridophyta (G. M. Smith Classification System to be followed)		
	2.1	Lepidophyta – Classification, general characters; Life cycle of <i>Lycopodium</i>	15 Lectures
	2.2	Calamophyta – Classification, general characters; Life cycle of <i>Equisetum</i>	
	2.3	Pterophyta - Classification, general characters; Life cycle of <i>Adiantum</i> and <i>Marselia</i>	
Unit III	Bryophytes and Pteridophytes: Applied aspects		
	3.1	Ecology and Economic of Bryophytes.	15 Lectures
	3.2	Bryophytes as Indicators.	

	3.3	Evolution of Sporophyte and Gametophyte in Bryophytes.	
	3.4	Economic importance of Pteridophytes	
	3.5	Diversity and distribution of Indian Pteridophytes	
	3.6	Types of Sori and Evolution of Sori in Pteridophytes.	
Unit- IV		Gymnosperms (Chamberlain's Classification System to be followed)	15 Lectures
	4.1	Life cycle of <i>Araucaria</i>	
		Life cycle of <i>Gnetum</i>	
		Life cycle of <i>Ephedra</i> .	
		Economic importance of Gymnosperms	

PROGRAM(s): T.Y. B. Sc		SEMESTER: VI			
Course: PLANT DIVERSITY IV			Course Code: WUSBOT602		
Teaching Scheme			Evaluation Scheme		
Lectures (Hours perweek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60

Learning Objectives:

The specific objectives of this course are to expose learners to the following topics:

1. To study eminent gardens of India
2. To study the adaptive and anatomical features of some plants.
3. To study the developmental biology of plants.
4. To study the diversity pattern as per the phytogeography.

Course Outcomes:**Learners will be able to:**

- CO1- Summarise the significance of eminent Botanical gardens, BSI to Angiosperm study.
 CO2 - Assign the plants to their respective families on the basis of morphological characters.
 CO3- Evaluate the phylogenetic system of classification.
 CO4- Classify the fruits on the basis of important characters.
 CO5- Gain insight into the anatomical adaptations of different ecological plant groups.
 CO6- Analyse development of male and female gametophytes, embryonic structure and its development.
 CO7- Compare the phytogeographical regions of India.
 CO8- Explain the concept, importance and types of biodiversity.
 CO9- Criticize the threats to biodiversity and management aspects of biodiversity.
 CO10- Point out various highlights and important provisions of the Biodiversity Act.

Course Title	PLANT DIVERSITY IV		3 Credits (60 lectures)
Course Code	WUSBOT602		
Unit I	Angiosperms II		
	1.1	Major Botanical Gardens of India and their Significance – Indian Botanic Garden, Howrah; National Botanic Garden (NBRI) Lucknow; Lloyd Botanic Garden, Darjeeling; Lalbaugh Botanic Garden, Bangaluru. Veermata Jijabai Bhosale Botanical Garden and Zoo, Mumbai	15 Lectures
	1.2	Botanical Survey of India (BSI) and regional branches of BSI	
	1.3	Bentham and Hooker's system of classification for flowering plants up to family with respect to the following prescribed families and economic importance, medicinal importance and fruit morphology for members of the families <ul style="list-style-type: none"> • Rhamnaceae 	

		<ul style="list-style-type: none"> • Asclepiadaceae • Labiatae • Cannaceae 	
	1.4	Types of Fruits - all major types	
	1.4	Hutchinson's classification system of Angiosperms - Brief Introduction, Merits and Demerits	
Unit II	Anatomy II		
	2.1	Ecological anatomy <ul style="list-style-type: none"> • Hydrophytes – submerged, floating, rooted • Hygrophytes -<i>Typha</i> • Mesophytes • Sciophytes • Halophytes • Epiphytes • Xerophytes 	15 Lectures
Unit III	Embryology		
	3.1	Microsporogenesis	15 Lectures
	3.2	Megasporogenesis- Development of monosporic type, examples of all embryo sacs	
	3.3	Types of ovules	
	3.4	Double fertilization	
	3.5	Development of embryo– <i>Capsella</i>	
Unit- IV	Plant Geography and Ecology		
	4.1	Phytogeographical Regions of India- in detail	
	4.2	Biodiversity: <ul style="list-style-type: none"> • Definition and concept • Diversity of flora found in various forest types of India • Levels of biodiversity • Importance and status of biodiversity • Loss of biodiversity/Threats to Biodiversity 	

		<ul style="list-style-type: none"> • Conservation of biodiversity 	
	4.3	Biological Diversity Act, 2002 - Highlights and important provisions of the Act.	

PROGRAM(s): T.Y. B.Sc.				SEMESTER: VI	
Course: FORM AND FUNCTION III				Course Code: WUSBOT603	
Teaching Scheme				Evaluation Scheme	
Lectures (Hours perweek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60
<p>Learning Objectives: The specific objectives of this course are to expose learners to the following topics:</p> <ol style="list-style-type: none"> 1. To study the different enzymatic activities and its effect in plants. 2. To study nitrogen metabolism and the effect of different stimuli in flowering. 3. To study the inborn genetic disorders and its causes. 4. To study the level of significance by applying appropriate statistical tools. 					
<p>Course Outcomes: Learners will be able to: CO1-Study the structures and role of enzymes. CO2- Understand the functions and applications of enzymes. CO3-Acquire insight into the nitrogen and plant hormone metabolism. CO4- Understand the physiology of flowering in plants. CO5-Understand principles of genetic mapping in organisms. CO6- Acquire knowledge of point mutations and its cause. CO7- Solve problems based on mutation. CO8- Gain knowledge of various metabolic disorders and their implications. CO9- Generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context, using suitable statistical techniques.</p>					
Course Title	FORM AND FUNCTION III				3 Credits

Course Code	WUSBOT603		(60 lectures)
Unit I	Plant Biochemistry		
	1.1	Enzymes: Introduction, nomenclature and classification of enzymes, Mechanism of enzyme action (Lock and key model, induced - fit model- Check before adding), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	15 Lectures
	1.2	Growth Regulators: se Auxins, Gibberellins, Cytokinins, Abscicic acid and Ethylene	
Unit II	Plant Physiology II		
	2.1	Nitrogen metabolism: Nitrogen cycle, Nitrate assimilation, biological nitrogen fixation (Legumes and non-legumes). Physiology and biochemistry of nitrogen fixation (Root nodule formation), nitrogenase and leghemoglobin. Ammonia assimilation and transamination.	15 Lectures
	2.2	Physiology of flowering: Photoperiodism, flowering stimulus, florigen concept and	
	2.3	Vernalization: Introduction, mechanism, importance and application. Devernalization.	
	2.4	Phytochrome: Chemical nature and role in photomorphogenesis and mode of action.	
Unit III	Genetics		
	3.1	Genetic mapping in eukaryotes: discovery of genetic linkage, gene recombination, construction of genetic maps, three- point crosses and mapping chromosomes, problems based on the same	15 Lectures
	3.2	Gene mutations: definition, types of mutations, causes of mutations, induced mutations, the Ame’s test	
	3.3	Metabolic disorders– enzymatic and non-enzymatic: Gene control of enzyme structure Garrod’s hypothesis of inborn errors of metabolism, Kartegener syndrome and Tay-Sachs Disease	

Unit- IV		Biostatistics (Shifted from Paper – II)	15 Lectures
	4.1	Test of significance student's <i>t</i> -test – Paired and Unpaired	
	4.2	Regression	
	4.3	ANOVA (one way)	

PROGRAM(s): T.Y. B.Sc.		SEMESTER: VI			
Course: Current Trends in Plant Science – II			Course Code: WUSBOT604		
Teaching Scheme			Evaluation Scheme		
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60
<p>Learning Objectives: The specific objectives of this course are to expose learners to the following topics:</p> <ol style="list-style-type: none"> 1. To study DNA sequencing and different molecular sequencing patterns . 2. To study the biology of organisms through information technology. 3. To study the extraction/economic aspect of essential plants. 4. To study the different presentation techniques in storing food items. 					

Course Outcomes:**Learners will be able to:**

- CO1–Describe recent molecular biology techniques for DNA analysis and amplification
 CO2- Understand plant barcoding techniques and applications therein.
 CO3-Apply tools of bioinformatics for data retrieval
 CO4- Understand the evolutionary tree and phylogenetic analysis.
 CO5-Identify plants which provide fats and oils and are economically important.
 CO6-Learn the extraction process of oils as well as fats and use
 CO7- Start entrepreneurship in the field of oil extraction.
 CO8-Gain knowledge and proficiency in preservation of post-harvest produce and explore the possibility of entrepreneurship in the field.

Course Title	Current Trends in Plant Science – II		3 Credits (60 lectures)
Course Code	WUSBOT604		
Unit I	Plant Biotechnology II		15 Lectures
	1.1	DNA sequence analysis – Maxam – Gilbert Method and Sanger’s method, Pyro Sequencing.	
	1.2	Polymerase Chain Reaction (PCR).	
	1.3	DNA barcoding: Basic features, nuclear genome sequence, chloroplast genome sequence, <i>rbcL</i> gene sequence, <i>mat K</i> gene sequence	
Unit II	Bioinformatics		15 Lectures
	2.1	Organization of biological data, databases	
	2.2	Exploration of data bases, retrieval of desired data, BLAST.	
	2.3	Protein structure analysis and application	
	2.4	Multiple sequence analysis and phylogenetic analysis	
Unit III	Economic Botany		15 Lectures
	3.1	Essential Oils: Extraction, perfumes, perfume oils, oil of Rose, Sandalwood, <i>Patchouli</i> , <i>Champaca</i> , grass oils: <i>Citronella</i> , Vetiver.	

	3.2	Fatty oils: Drying oil (Linseed and Soyabean oil), semi drying oils (Cotton seed, Sesame oil) and non-drying oils (Olive oil and Peanut oil),	
	3.3	Vegetable Fats: Coconut and Palm oil	
Unit- IV		Post-Harvest Technology	
	4.1	Storage of Plant Produce –Preservation of Fruits and Vegetables <ul style="list-style-type: none"> • Drying (Dehydration) – Natural conditions – Sun drying, Artificial Drying – Hot Air Drying, Vacuum Drying, Osmotically Dried Fruits, Crystallized or Candied Fruits, Fruit Leather, Freeze Drying) 	15 Lectures
	4.2	Freezing (Cold Air Blast System, Liquid Immersion method, Plate Freezers, Cryogenic Freezing, Dehydro-Freezing, Freeze Drying),	
	4.3	Canning	
	4.4	Pickling (in Brine, in Vinegar, Indian Pickles)	
	4.5	Sugar Concentrates (Jams, Jellies, Fruit juices)	
	4.6	Food Preservatives	
	4.7	Use of Antioxidants in Preservation	

SEMESTER VI PRACTICAL

PROGRAM(s): T.Y. B.Sc.	SEMESTER: VI	
Course: Botany Practical 7	Course Code: WUSBOT6P1	
Teaching Scheme	Evaluation Scheme	

Lectures (Hours perweek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
-	6.4	-	4	40	60

SEMESTER VI USBOP8 – FOR 6 UNITS	Credit 2
PRACTICAL PAPER I–PLANT DIVERSITY III – WUSBOTP 601(For 6 Units)	
Bryophyta (G.M. Smith Classification System to be followed) <ul style="list-style-type: none"> • Study of stages in the life cycle of the following Bryophyta from fresh / preserved material and permanent slides <ul style="list-style-type: none"> • <i>Marchantia</i> • <i>Pelia</i> • <i>Sphagnum</i> 	
Pteridophyta (G.M. Smith Classification System to be followed) <ul style="list-style-type: none"> • Study of stages in the life cycles of the following Pteridophytes from fresh / preserved material and permanent slides <ul style="list-style-type: none"> • <i>Lycopodium</i> • <i>Equisetum</i> • <i>Adiantum</i> • <i>Marselia</i> 	
Bryophytes and Pteridophytes: Applied aspects <ul style="list-style-type: none"> • Economic importance of Bryophyta • Economic importance of Pteridophyta • Types of Sporophytes in Bryophyta (from Permanent slides) • Types of Sori and Soral Arrangement in Pteridophytes 	
Gymnosperms (Chamberlain’s Classification System to be followed) <ul style="list-style-type: none"> • Study of stages in the life cycles of the following Gymnosperms from fresh / preserved material and permanent slides <ul style="list-style-type: none"> • <i>Thuja</i> • <i>Gnetum</i> • <i>Ephedra</i> • Economic importance of Gymnosperms 	
USBOP10 – FOR 3 UNITS	Credit 2
PRACTICAL PAPER II–PLANT DIVERSITY IV WUSBOTP (For 3 & 6 Units)	

Angiosperms II

- Study of one plant from each of the following Angiosperm families as per Bentham and Hooker's system of classification.
 - Rhamnaceae
 - Asclepiadaceae
 - Labiatae
 - Cannaceae
- Morphological peculiarities and economic importance of the members of the above-mentioned Angiosperm families
- Types of fruits - all major types
- Identify the genus and species with the help of flora

Anatomy II

- Study of Ecological Anatomy of
 - Hydrophytes: *Hydrilla* stem, *Nymphaea* petiole, *Eichhornia* offset
 - Epiphytes: Orchid
 - Sciophytes: *Peperomia* leaf
 - Xerophytes: *Nerium* leaf, *Opuntia phylloclade*
 - Halophytes: *Avicennia* leaf and pneumatophore, *Sesuvium* / *Sueda* leaf
 - Mesophytes: *Vinca* leaf

Embryology

- Study of various stages of Microsporogenesis, Megasporeogenesis and Embryo Development with the help of permanent slides / photomicrographs
- Mounting of Monocot (Maize) and Dicot (Castor and Gram)embryo
- *In vivo* growth of pollen tube in *Portulaca* / *Vinca*

Plant Geography

- Study of phytogeographic regions of India
- Problems based on Simpson's diversity Index

PROGRAM(s): T.Y. B.Sc.**SEMESTER: VI****Course: Botany Practical 8****Course Code: WUSBOT6P2****Teaching Scheme****Evaluation Scheme**

Lectures (Hours perweek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
-	6.4	-	4	40	60

SEMESTER VI USBOP9 – FOR 6 UNITS	Credit 2
PRACTICAL PAPER III–FORM AND FUNCTION III WUSBOTP603 (For 3 & 6 Units)	
Plant Biochemistry <ul style="list-style-type: none"> • Estimation of proteins by Biuret method • Effect of temperature on the activity of amylase • Effect of pH on the activity of amylase • Effect of substrate variation on the activity of amylase 	
Plant Physiology II <ul style="list-style-type: none"> • Determination of alpha-amino nitrogen • Effect of GA on seed germination • Estimation of reducing sugars by DNSA method 	
Genetics <ul style="list-style-type: none"> • Problems based on three-point crosses, construction of chromosome maps • Identification of types of mutations from given DNA sequences • Study of mitosis using pre-treated root tips of <i>Allium</i> 	
Biostatistics <ul style="list-style-type: none"> • <i>t</i>-test (paired and unpaired) • Problems based on regression analysis • ANOVA (One Way) 	
PRACTICAL PAPER IV CURRENT TRENDS IN PLANT SCIENCES WUSBOTP 604 (For 6 Units)	Credit 2
Plant Biotechnology II <ul style="list-style-type: none"> • DNA sequencing by Sanger’s Method 	

Bioinformatics <ul style="list-style-type: none"> • BLAST: nBLAST, pBLAST • Multiple sequence alignment • Phylogenetic analysis • RASMOL/SPDBV 	
Economic Botany <ul style="list-style-type: none"> • Demonstration: Extraction of essential oil using Clevenger • Thin layer chromatography of essential oil of <i>Patchouli</i> and <i>Citronella</i> • Saponification value of Palm oil 	
Post-Harvest Technology <ul style="list-style-type: none"> • Preparation of <ul style="list-style-type: none"> • Squash • Jam • Jelly • Pickle 	

Applied Component Theory Sem- VI
T.Y.B.Sc. Applied Component Horticulture Syllabus
To be implemented from the Academic year

PROGRAM(s): T.Y. B. Sc		SEMESTER: VI			
Course: Botany Applied Component - Horticulture and Gardening –II			Course Code: WUSBOT605		
Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
3.2	-	-	3	40	60

Learning Objectives: The objectives of the course are:

1. To make students familiar with the concept of professional landscaping , its principles, planning and features
2. To expose students to various special modern concepts of gardens
3. To enrich the knowledge of the students of various garden styles and eminent gardens of India
4. To introduce the students to hi-tech horticulture - greenhouse technology, commercial cultivation of floriculture crops, international status of floriculture etc
5. To update the students with various aspects of the commercial cultivation of important crops from different categories of crops.
6. To make students aware with the concepts like maturity, harvesting, post harvest management, storage, preservation, marketing and entrepreneurship opportunities in the field of horticulture

Course Outcomes: The learners will be able to -

1. Recall the elements and principles of landscape gardening
2. Explain various features of the landscape gardens
3. Design the landscape garden plans
4. Illustrate various garden styles and eminent gardens studied by them
5. Produce the basic designs of the greenhouse
6. Explain the special requirements of plants cultivated under greenhouse or at commercial level
7. Evaluate the importance of various aspects covered under the post harvest technology and marketing
8. Develop the business ideas pertaining to horticulture

Course Title	Horticulture AND Gardening –II		3 Credits (60 lectures)
Course Code	WUSBOT605		
Unit I	LANDSCAPE GARDENING		
	1.1	Elements and Principles of landscaping garden design.	15 Lectures
	1.2	Special gardens -Indoor Gardens, Hydroponics, Terrarium Dish garden and Vertical Gardens, Theme parks	
	1.3	Important garden features- Fencing, Paths & Avenues, Hedges & Edges, Lawn, Flowerbeds, Arches & Pergolas, Water Garden, Rock Garden & Plants suitable for different features	
	1.4	Lawn- Purposes of preparation of lawn, Site preparation, grass varieties, Planting methods, & management of lawn.	

	1.6	Styles of garden: Mughal, Buddhist, Hindu, British styles of garden.	
	1.7	Important Gardens of India—Shalimar (Srinagar), Vrindavan (Mysore), Veer Jijamata Udyan (Mumbai)	
Unit II	HI-TECH HORTICULTURE		
	2.1	Greenhouse Technology- Concept of greenhouse, types of greenhouse, layout & construction, construction and covering materials, beds, irrigation systems, internal systems to control growth parameters, preferred plants, limitations of GHT, advantages and future scope.	15 Lectures
	2.2	Hi-Tech floriculture – Scope & importance of floriculture, Commercial cultivation of selected flowering plants under greenhouse - Gerbera, Carnation, Roses and Orchids w.r.t. soil, temperature, humidity, propagation, major concerns, varieties, packaging, storing, transportation and market scope.	
	2.3	Special Methods used for enhancing and delaying the period of bloom.	
	2.4	Modern floral/Florist Shops (Flower Malls)	
	2.5	International markets and economic aspects of floriculture	
Unit III	COMMERCIAL PRODUCTION		
	3.1	Commercial production of the following – in relation to propagation, post plantation care, harvesting, post harvest management & varieties. <ul style="list-style-type: none"> ○ Tubers- Potato ○ Vegetables- Tomato ○ Fruits- Mango, Grapes & Coconut ○ Spices/condiments- Chilly and Turmeric ○ Medicinal plants- <i>Aloe vera</i>, <i>Stevia</i> (Madura) ○ Aromatic plant- <i>Citronella</i>, <i>Patchouli</i> 	15 Lectures
Unit- IV		POST HARVEST TECHNOLOGY & ENTREPRENEURSHIP IN HORTICULTURE	15 Lectures

	4.1	Maturity- Factors responsible for maturity & ripening methods used for delaying ripening.
	4.2	Harvest- Time of harvest, types of harvesting and handling of harvested products
	4.3	Storage of fresh produce- Types of storage of fruits & vegetables for temporary purpose till transported.
	4.4	Fruit & vegetables preservation technology - brief introduction to various techniques
	4.5	Marketing- grading, packing & transportation. Ways of increasing the market value and shelf life of horticultural produce.
	4.6	Horticultural farm- Horticulture farm as a business: introduction and nature, organization, planning and operation.
	4.7	Current Business/Entrepreneurship opportunities in Horticulture

T.Y.B.Sc. Practical Sem- VI
Applied Component Horticulture
To be implemented from the Academic year 2024-2025

PROGRAM(s): T.Y. B.Sc.		SEMESTER: VI			
Course: Botany Applied Component Practical - Horticulture and Gardening II			Course Code: WUSBOT6P3		
Teaching Scheme			Evaluation Scheme		
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Internal Assessment (CIA) (Marks- 40)	Semester End Examination (Marks- 60)
-	3.2	-	2	40	60

Semester VI- For 6 Units	Course Code: WUSBOT6P3 –	Credit 2
PRACTICAL –PAPER: Applied Component-II - Horticulture and Gardening		
Preparation of garden layout		
Identification of plants suitable for garden locations- 2-3 plants for each location .		
Flower arrangements –Indian (Gajara , veni, garland) Bouquet, Baskets, Japanese (Ikebana) and western type		
Preparation of Jams, Squashes/ Syrups, Pickle, Sauce, Chocolate		
Study of Greenhouse plants- Information regarding- soil, temperature, irrigation, nutrients requirements and propagation methods for <i>Anthurium</i> , <i>Gerbera</i> , Orchids, Tuberose, Carnation, Roses, <i>Capsicum</i>		
2 Visits : To Garden /Parks / Nurseries/ Exhibition / Horticulture Industries / Research Station and record of visits should be duly certified and presented at practical examination.		
Project – Each student should individually present a project related to any topic related to Horticulture. It should be duly certified and presented at practical examination. Project presentation at college level is compulsory.		

Modality of Assessment (Semester V and VI)

Theory Examination Pattern:

A. Internal Assessment- (40%) - 40 Marks per paper

Sr. No.	Evaluation Type	Marks
1.	Written Objective Examination	20
2.	Assignment/ Case study/ Field visit report/ Presentation/ Project/ Theme based photography	20

	Total	40
--	--------------	-----------

B. External Examination- (60%) - 60 Marks per paper

Semester End Theory Examination:

1. Duration - This examination shall be of **two hours** duration.
2. Theory question paper pattern:
 - a. There shall be 04 questions each of 15 marks on each unit.
 - b. All questions shall be compulsory with 100 % internal choice.

Paper Pattern:

Question	Options	Marks	Questions Based on
Q 1.1 Descriptive	100%	10	Unit I
Q1.2 Short Notes	100%	5	
Q 1.1 Descriptive	100%	10	Unit II
Q1.2 Short Notes	100%	5	
Q 1.1 Descriptive	100%	10	Unit III
Q1.2 Short Notes	100%	5	
Q 1.1 Descriptive	100%	10	Unit IV
Q1.2 Short Notes	100%	5	
	TOTAL	60	

45

Practical Examination Pattern:

A. Internal Examination: (40%) - 20/40 Marks

Particulars	Paper I	Paper II	Paper III	Paper IV	Paper AC
-------------	---------	----------	-----------	----------	----------

Journal	5	5	5	5	10
Experimental tasks/Test	10	10	10	10	20
Participation	5	5	5	5	10
Total	20	20	20	20	40

B. External Examination: (60%) - 30/60 Marks

Semester End Practical Examination:

Particulars	Paper I	Paper II	Paper III	Paper IV	AC
Laboratory work	24	24	24	24	30
Spots/Viva	6	6	6	6	15
Project Work	–	–	–	–	15
Total	30	30	30	30	60

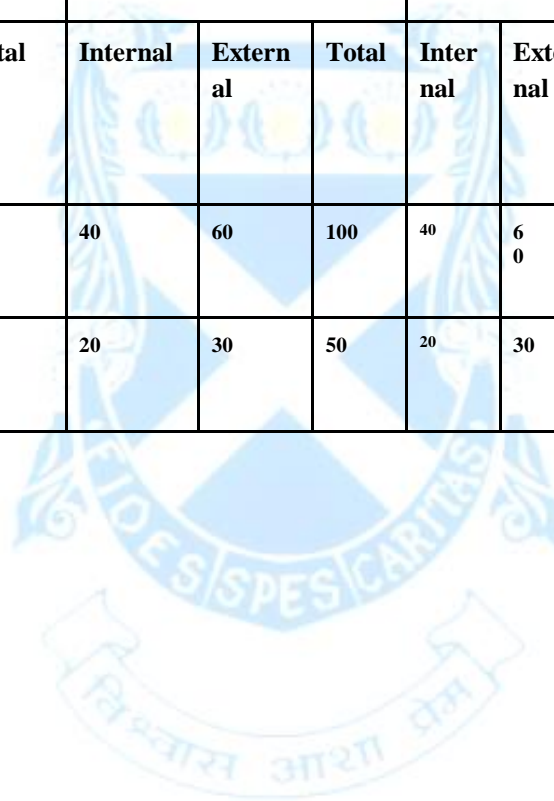
PRACTICAL BOOK/JOURNAL

The students are required to perform 75% of the Practical for the journal to be duly certified. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

Overall Examination & Marks Distribution Pattern

Semester V and VI

Course	501			502			503			504			AC		
	Internal	External	Total	Internal	External	Total	Internal	External	Total	Internal	External	Total	Internal	External	Total
Theory	40	60	100	40	60	100	40	60	100	40	60	100	40	60	100
Practical	20	30	50	20	30	50	20	30	50	20	30	50	40	60	100



References for Semester V and VI

01. A handbook of Ethnobotany by S.K. Jain, V. Mudgal
02. Plants in folk religion and mythology (Contribution to Ethnobotany by S.K.Jain 3rd Rev.Ed.).
03. Introduction to Plant Physiology by Noggle and Fritz, Prentice Hall Publishers (2002)
04. Plant Physiology by Salisbury and Ross CBS Publishers
05. Plant Physiology by Taiz and Zeiger Sinauer Associates Inc. Publishers, 2002
06. Genetics by Russel Peter Adison Wesley Longman Inc. (5th edition)
07. An introduction to Genetic analysis Griffith Freeman and Company(2000)
08. Fundamentals of Biostatistics by Rastogi, Ane Books Pvt. Ltd.(2009).
09. College Botany Vol I and II by Gangulee Das and Dutta Central Education enterprises.
10. Cryptogamic Botany Vol I and II by G M Smith, Mcgraw Hill
11. Industrial Microbiology by Cassida, New Age International, New Delhi
12. Industrial Microbiology MacMillan Publications, New Delhi
13. Physiological Plant Anatomy by Haberlandt, Mac Millan and Company
14. Ayurveda Ahar by P H Kulkarni
15. Pharmacognosy by Kokate, Purohit and Gokhale, Nirali Publications
16. Bioinformatics by Sunder Rajan
17. Instant Notes on Bioinformatics by Westhead (2002), Taylor Francis Publications.
18. Bioinformatics by Ignasimuthu
19. DNA barcoding plants: taxonomy in a new perspective 2010. K Vijayan and C H Tsou, Current Science, 1530 –1541.
20. Introduction to Biostatistics by P K Banerjee, Chand Publication.
21. Plant Biotechnology by K. Ramawat
22. Practical Biochemistry by David Plummer, McGraw Hill Publ.
23. Economic Botany by A F Hill, TATA McGRAW-HILL Publishing Co. Ltd.
24. Post-Harvest Technology by Verma and Joshi, Indus Publication
25. Embryology of Plants by Bhojwani and Bhatnagar
26. Pollen Morphology and Plant Taxonomy by G. Erdtman, Hafner Publ. Co., N.Y.
27. A text Book of Palynology by K Bhattacharya, New Central Book Agency Pvt. Ltd., London
28. An introduction to Embryology of Angiosperms by P Maheshwari, McGraw Hill Book Co.
29. Plant Systematics by Gurcharan Singh, Oxford and IBH Publ.
30. Taxonomy of Vascular Plants by Lawrence George, H M, Oxford and IBH Publ.