



Karmaveer Bhaurao Patil University, Satara

Syllabus for

B. Sc. II Botany

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2025-2026

Syllabus for Bachelor of Science (B. Sc.) Part – II Botany

PREAMBLE:

The B. Sc. Botany course under autonomy will be effective from the academic year 2025- 2026. It has been prepared to keep in view the unique requirements of B. Sc. Botany students as per NEP-2020. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences. The emphasis is to provide students with the latest information along with due weightage to the concepts of classical botany so that they can understand and appreciate the current interdisciplinary approaches in the study of plant sciences and their role in societal development. The course content also lists new practical exercises so the students get a hands-on experience with the latest techniques that are currently in use. The course will also inspire students to pursue higher studies in botany, for becoming an entrepreneur, and enable students to get employed in plant-based industries.

GENERAL OBJECTIVES OF THE COURSE:

1. To impart the knowledge of plant science is the basic objective of this course.
2. To develop a scientific attitude among the students and to make the students open-minded, critical, and curious.
3. To develop skills in practical work, experiments, and laboratory materials.
4. To understand scientific terms, concepts, facts, phenomenon, and their relationships.
5. To make the students aware of natural resources and the environment.
6. To enable the students to acquire knowledge of plants and related subjects to understand nature and the environment for the benefit of human beings.
7. To develop the ability for the application of acquired knowledge to improve agriculture and related fields to make themselves self-reliant.

PROGRAMME OUTCOMES:

After completing B. Sc. Program, the students will.....

1. Graduate with proficiency in the subject.
2. Develop scientific attitude and become open minded, critical and curious so that they enter research field with a positive approach.
3. Develop skill in practical work, experiments and laboratory materials
4. Become eligible to continue higher studies in their subject in India as well as abroad.

5. Become eligible to appear for the examinations for jobs in government organizations.
6. Become eligible to appear for jobs with minimum eligibility as science graduate.
7. Be able to establish their own entrepreneurial ventures.
8. Acquire increased ability of critical thinking, development of scientific attitude, handling of problems and generating solution, improve practical skills, enhance communication skill, social interaction, increase awareness in judicious use of plant resources by recognizing the ethical value system

PROGRAM SPECIFIC OBJECTIVES:

1. The students are expected to understand the fundamentals, principles, concepts and recent developments in the botany.
2. The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in botany
3. It is expected to inspire and boost interest of the students in botany
4. To develop the power of appreciations, the achievements in science and role in nature and society
5. To enhance student sense of enthusiasm for science and to involve them in an intellectually stimulating experience of Course in a supportive environment.

PROGRAMME SPECIFIC OUTCOMES:

After completing B. Sc. (Botany) Program the students will.....

1. Explain, describe, discuss and ask questions related to the different aspects of plant sciences.
2. Perform and design experiments related to plant sciences
3. Critically analyze the interactions between the living and non- living entities around them.
4. Apply the knowledge of plant sciences in finding sustainable solutions for the society as well as industry.
5. Apply the knowledge of plant sciences in becoming self- reliant either through entering into a job, establishing a model agricultural set up or initiating a plant based entrepreneurial venture
6. Design and undertake projects related to plant sciences
7. Attain skills needed in the plant based industries through internship.

8. Improve the research based skills by entering into a research internship as well as in house project.
9. Present their research findings in research conglomerations like conferences and in research journals in the form of publications.
10. Critically analyze their role as an environment sustainability goals oriented citizen

1. TITLE: Botany

2. YEAR OF IMPLEMENTATION: 2025 - 26

3. DURATION: 01 year

4. PATTERN: Semester examination.

5. MEDIUM OF INSTRUCTION: English

6. ELIGIBILITY OF THE STUDENT:

As per guidelines obtained from university by following rules and regarding reservations by Govt. of Maharashtra

7.ELIGIBILITY OF THE CORE FACULTY:

As per the rules and regulations of the University Grants Commission (UGC) and the Government of Maharashtra

8. STRUCTURE OF COURSE: As per B.Sc. II NEP 2.0

Third Semester (Level 5.0)

Sr. No.	Course	Theory				Practical		
		Course Code	Title of Course	No. of lectures per week	Credits	Cours Code	No. of lectures Per week	Credits
1	Major	BBT 231	Plant Anatomy	2	2	BBP 233	2	2
		BBT 232	Plant Biochemistry	2	2			
2	Minor	BBT 234	Plant Propagation Techniques	2	2	BBP 236	2	2
		BBT 235	Industrial Botany	2	2			
3	OE	BBPOE III		2	2	–	–	–
4	VSC		Advanced Botanical Skills Part - I (Microtechniques, Slide preparation & Staining Techniques)	--	--	BBPVSC I	2	2
5	SEC	BBPSEC I	Botanical Illustrations and Photography			BBPSEC I	2	2
6	AEC	BBTAEC I	English	2	2			
7	IKS	BBTIKS II	Indian Agriculture	2	2			

Fourth Semester (Level 5.0)

Sr. No.	Course	Theory				Practical		
		Course Code	Title of Course	No. of lecture s per week	Credits	Course Code	No. of lectures Per week	Credits
1	Major	BBT 241	Plant Embryology	2	2	BBP 243	2	2
		BBT 242	Plant Ecology & Environment	2	2			
2	Minor	BBT 244	Green House Technology	2	2	BBP 246	2	2
		BBT 245	Agrotourism	2	2			
3	OE	BBTOE IV		2	2		—	—
4	VSC		Advanced Botanical Skills Part-II (Plant Collection, Identification & Preservation)	--	---	BBPVSCII	2	2
5	SEC		Medicinal Plant Cultivation Techniques			BBPSEC II	2	2
6	AEC	BBTAEC II	English	2	2	--	--	--
7	VEC	BBTVEC II	Environmental studies in Botany	2	2	--	--	--

9. Evaluation Structure: As per B.Sc. II NEP 2.0

Semester III

Course	Course Category	Course Code	Internal Evaluation (Best of two CCE Marks will be considered)			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
Major	T	BBT 231	10	10	10	30	50	02
	T	BBT 232	10	10	10	30	50	02
	P	BBP 233	--	--	--	50	50	02
Minor	T	BBT 234	10	10	10	30	50	02
	T	BBT 235	10	10	10	30	50	02
	P	BBP 236	--	--	--	50	50	02
OE	T	BBTOE 3 (For IDS Courses)	05	--	05	15	25	01
	P	B*POE 3	--	--	--	25	25	01
OE	T	B*TOE 3 (For Humanities)	10	10	10	30	50	02
VSC	P	BBPVSC 1	--	--	--	50	50	02
SEC	P	BBPSEC 1	--	--	--	50	50	02
AEC	T	BBTAEC 1	10	10	10	30	50	02
IKS	T	BBTIKS 2	10	10	10	30	50	02
Total							550	22

Semester IV

Course	Course Category	Course Code	Internal Evaluation (Best of two CCE Marks will be considered)			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
Major	T	BBT 241	10	10	10	30	50	02
	T	BBT 242	10	10	10	30	50	02
	P	BBP 243	--	--	--	50	50	02
Minor	T	BBT 244	10	10	10	30	50	02
	T	BBT 245	10	10	10	30	50	02
	P	BBP 246	--	--	--	50	50	02
OE	T	B*TOE 4 (For IDS Courses)	05	--	05	15	25	01
	P	B*POE 4	--	--	--	25	25	01
OE	T	B*TOE 4 (For Humanities)	10	10	10	30	50	02
VSC	P	BBPVSC 2	--	--	--	50	50	02
SEC	P	BBPSEC 2	--	--	--	50	50	02
AEC	T	BBTAEC 2	10	10	10	30	50	02
VEC	T	BBTVEC 2	10	10	10	30	50	02
Total							550	22

10. Other features:

A) LIBRARY:

Reference books, Textbooks, journals, and Periodicals are available in Institute and Departmental Library. (Separate reference lists are attached along with the respective course syllabus)

B) EQUIPMENT:

a) Computer, LCD projector, visualizer, smart board

b) Laboratory Equipment:

- | | | |
|-------------------------------------|-----------------|--------------------------------|
| 1. Microscope with a digital camera | 2. Hot Air Oven | 3. Digital weighing balance |
| 4. Incubator | 5. pH meter | 6. Refrigerator |
| | | 7. Microtome 8. Autoclave etc. |

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - III
	Type : DSC V (Major-I)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Plant Anatomy (BBT 231)		
Course Objectives: The students should be able to... 1. Learn about awareness of the basic concepts of plant anatomy. 2. Understand the anatomical framework of angiosperms. 3. Acquaint the different types of tissue systems in plants. 4. learn the concepts of primary and secondary growth in plants.		
Course Outcomes: The students will be able to... 1. Analyze the composition of different parts of a plant. 2. Describe the structure and function of meristematic tissues in plants. 3. Identify and classify various types of plant tissue systems. 4. Recognize and explain the different stages of plant growth.		
Module	Title and Contents	Hrs
Module -1	Module -1: Organization of higher plant body 1.1 Development of plant body 1.2 The plant organs; 1.3 Internal organization of the plant body (stem and leaf)	07
Module -2	Module -2: Meristematic and Permanent Tissue Meristem: 2.1 Introduction, Characteristics and Classification of meristems based on position 2.2 Theories of structural development a) Apical cell theory b) Histogen theory; c) Tunica Corpus theory Permanent tissue: 2.3 Simple tissues: Parenchyma (Chlorenchyma, Aerenchyma) Collenchyma and Sclerenchyma 2.4 Complex tissues: Xylem and Phloem; types of Vascular bundles	08

Module -3	Module -3: Tissue systems 3.1 Epidermal tissue system (Structure and Function); Uniseriate and multiple; epidermal outgrowths-unicellular, multicellular, glandular and non-glandular; stomata- structure, types and function. 3.2 Secretory tissue system: Glandular and lactiferous. 3.3 Mechanical tissue system: distribution of mechanical tissue in leaf, stem and root of dicot and monocot.	07
Module -4	Module -4: Primary and secondary structure of plant body 4.1 Primary structure of root, stem and leaf of Monocotyledon and Dicotyledon. 4.2 Normal secondary growth in Dicotyledon root and stem 4.3 Structure and function of periderm (bark and lenticels) 4.4 Anomalous secondary growth; definition and causes, 4.5 Anomalous secondary growth in <i>Bignonia</i> (Dicot) and <i>Dracaena</i> (Monocot) stem.	08

Reference Books: -

1. Beck, C. B. "An Introduction to Plant Structure and Development." 1st ed. Cambridge: Cambridge University Press, 2005.
2. Bowes, B. G., and J. D. Mauseth. "Plant Structure: A Colour Guide." 2nd ed. London: Manson Publishing, 2008.
3. Chandurkar, P. J. "Plant Anatomy." New Delhi: Oxford and IBH Publishing Co., 1971.
4. Cutler, D. F., T. Botha, and D. W. Stevenson. "Plant Anatomy: An Applied Approach." Oxford: Blackwell Publishing, 2008.
5. Dickison, W. C. "Integrative Plant Anatomy." New York: Harcourt Academic Press, 2000.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation:(20 Marks): • CCE-1: Home Assignment: 10 Marks • CCE-II :Short and long answer questions Test/Seminar/Open Book Test/Quiz/Case study/Book review/Field work/ Industry visit: 10 Marks • CCE-III: MCQ Test:10 Marks Note: Internal evaluation (Best of two CCE Marks will be considered)	End Semester Examination:(30Marks): • Question-1: Solve the following questions (five questions of 2 marks) 10 M • Question-2: Attempt any two questions (three questions of 10marks) 20 M • Question-3: Attempt any four questions (five questions of 5 marks) 20 M Note: Conversion of 50 marks of ESE to 30 marks
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	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - III
	Type: DSC VI (Major-II)	Marks: 50
	Credits: 2	From: A. Y. 2025-26
Name of the Course: Plant Biochemistry (BBT 232)		
Course Objectives: The students should be able to... 1. Know the structure and behavior of biomolecules. 2. Study and explain the structure and properties of various substances. 3. Understand the biological roles of biomolecules. 4. Learn basic knowledge of key aspects of enzymology		
Course Outcomes: The students will be able to... 1. Classify monosaccharides as aldoses or ketoses and determine the number of carbon atoms they contain. 2. Evaluate the roles of enzymes in plant physiological processes. 3. Apply knowledge of plant biochemistry to analyze and interpret biochemical processes and metabolic pathways involved in crop growth, development, and metabolism		
Module	Title and Contents	Hrs
Module -1	Module -1: Carbohydrates 1.1 Introduction 1.2 Classification of Carbohydrates 1.3 Structure and properties of monosaccharides (glucose and fructose), oligosaccharides (sucrose and maltose) and polysaccharides (starch and cellulose); 1.4 Biological role of carbohydrates	07
Module -2	Module -2: Proteins 2.1 Introduction 2.2 classification of Amino acids 2.3 Structure, properties and biological role of amino acids 2.4 Proteins - classification, structure (primary, secondary, tertiary and quaternary), properties and biological role of proteins	08

Module -3	Module -3: Lipids 3.1 Introduction 3.2 Classification of Lipids 3.3 Structure & properties of Lipids 3.4 Biological role of fatty acids and lipids	07
Module -4	Module -4: Enzymes 4.1. Nomenclature and classification, 4.2. Mode of action, 4.3. Enzyme kinetics, Michaelis Menten equation, 4.4 competitive, non- competitive, and uncompetitive inhibitors.	08

Reference Books: -

1. Berg, Jeremy M., John L. Tymoczko, and Lubert Stryer. "Biochemistry." 7th ed. New York: W.H. Freeman and Company, 2012.
2. Devlin, Thomas M. "Textbook of Biochemistry with Clinical Correlations." 7th ed. New York: John Wiley & Sons, Inc., 2011.
3. Jain, J. L., Sunjay Jain, and Nitin Jain. "Fundamentals of Biochemistry." New Delhi: S. Chand & Company Ltd., 2016.
4. Nelson, David L., and Michael M. Cox. "Lehninger: Principles of Biochemistry." 6th ed. New York: W.H. Freeman and Company, 2013.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 Marks):

- CCE-1: Home Assignment: 10 Marks
- CCE-II: Short and long answer questions
Test/Seminar/Open Book Test/Quiz/Case study/Book review/Field work/ Industry visit: 10 Marks
- CCE-III: MCQ Test: 10 Marks

Note: Internal evaluation (Best of two CCE Marks will be considered)

End Semester Examination (30Marks):

- Question-1: Solve the following questions (five questions of 2 marks) 10 M
- Question-2: Attempt any two questions (three questions of 10marks) 20 M
- Question-3: Attempt any four questions (five questions of 5 marks) 20 M

Note: Conversion of 50 marks of ESE to 30 marks

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	Board of Studies in Botany		
	Programme: B.Sc	Semester – III	
	Type: DSC P (Major Practical-I)	Marks: 50	
	Credits: 2	From: A. Y. 2025-26	
	Name of the Course: Major Practical-I (BBP 233) (Practical Based on Course BBT 231& 232)		
Course Objectives: The students should be able to...			
1. Understand the anatomical features of plants. 2. Identify and describe the morphological features of angiosperms. 3. Understand various physiological processes in plants. 4. Exercise on Hands-on Laboratory Practicals			
Course Outcomes: The students will be able to...			
1. Identify meristematic tissues in plants. 2. Compare and contrast different types of plant tissue systems. 3. Distinguish between various stages of plant growth. 4. Examine and describe the primary and secondary structures of the plant body.			
Practical No.	Title and Contents (Any 15 of the following)		Hrs
1	Study of shoot apex and root apex by permanent slides.		04
2	Study of simple tissues and complex tissues.		04
3	Study of epidermal tissue system, mechanical tissue system and secretory tissue system.		04
4	Double stained permanent micro preparation of any suitable material.		04
5	Study of primary structure of dicot stem and monocot stem.		04
6	Studies of normal secondary growth in dicot stem (Annona / Moringa/ Sunflower) by temporary double stained preparation.		04
7	Study of anomalous/abnormal secondary growth in <i>Bignonia</i> (Dicot stem		04
8	Study of anomalous/abnormal secondary growth in <i>Dracaena</i> (Monocot stem).		04
9	Study of Periderm and Lenticel.		04
10	Estimation of soluble protein by Lowry’s method.		04

11	Estimation of amino acids by Ninhydrin method.	04
12-15	Chemical tests to demonstrate the presence of starch, sugar, protein fat, in plant material.	04
16	Separation of amino acids by paper chromatography	04
17	Effect of temperature on the activity of Catalase enzyme	04
18	Effect of pH on the activity of dehydrogenase enzyme	04
19	Effect of substrate variation on the activity of amylase	04

Reference Books:-

1. Bendre, A. "Practical Botany." Meerut: Rastogi Publications, 2010.
2. Crang, Richard, Sheila Lyons-Sobaski, and Robert Wise. "Plant Anatomy." Springer, 2018.
3. Foster, Adriance S. "Practical Plant Anatomy." India: Maxwell Press, 2023.
4. Gour, Lokesh, Radheshyam Sharma, and R. Shiv Rama Krishnan. "Fundamentals of Plant Biochemistry and Biotechnology: A Practical Book." New Delhi: AkiNik Publications, 2020.
5. Gupta, Sunita, N. K. Gupta, and M. K. Sangha. "Practicals in Plant Physiology and Biochemistry." Edited by Manju Bala. Scientific Publishers, 2016.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions

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	Programme: B.Sc	Semester - III
	Type : DSC V (Minor-I)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Plant Propagation Techniques (BBT 234)		
Course Objectives: The students should be able to... 1. Understand the biology behind plant propagation. 2. Identify and explain different methods of asexual propagation. 3. Learn propagation through specialized structures. 4. Know various aspects of plant tissue culture.		
Course Outcomes: The students will be able to... 1. Recognize and differentiate between various plant propagation techniques. 2. Identify and distinguish between sexual and asexual methods of plant propagation. 3. Perform plant propagation using plant tissue culture techniques. 4. Distinguish between hydroponics, aeroponics, and aquaponics systems.		
Module	Title and Contents	Hrs
Module -1	Module -1: Plant Propagation 1.1 Introduction. 1.2 Biology of propagation: Asexual and sexual methods of propagations; its advantages and disadvantages. 1.3 Apomixis and Polyembryony. 1.4 Propagation facilities: Mist chamber, humidifiers, greenhouses, glasshouses, poly-houses, phytotrons nursery - tools and implements. 1.5 Propagation by division and separations: Bulbs, pseudobulbs, corms, tubers and rhizomes; runners, stolon, suckers and offsets.	07
Module -2	Module -2: Vegetative propagation 2.1 Cuttings: Definition, types, Plant propagation by herbaceous, soft wood, semi hard wood, hard wood cuttings. 2.2 Physiological and biochemical basis of rooting; factors influencing rooting of cuttings; Use of plant growth regulators in rooting of cuttings.	08

	2.3 Layering: Definition, Plant propagation by layering: tip layering, simple layering, trench layering, mound (stool) layering and compound (serpentine layering), air layering. 2.4 Grafting: Definition, scion-stock relationship; Propagation by whip, cleft, side, and bark grafting. 2.5 Budding: Definition; techniques of 'T', inverted 'T', patch and chip budding.	
Module -3	Module -3: Plant Tissue culture 3.1 Introduction and history of plant tissue culture 3.2 Totipotency, differentiation, dedifferentiation, redifferentiation. 3.3 Culture media, phytohormones, and environmental conditions. 3.4 Applications of plant tissue culture. Micropropagation, embryo culture, Haploid Production, callus culture, cell culture, somatic embryogenesis. 3.5 Synthetic seeds	07
Module -4	Module -4: Hydroponics and aeroponics 4.1 Basics of different soil-less growing systems: hydroponics, aeroponics, aquaponics. 4.2 Commercial aspects and advancements. 4.3 Media used for Hydroponics: Clay, Rock wool, cocopeat, Perlite, Pumice, Vermiculite, Sand, Gravel, Hydroton, Polystyrene packing peanuts, wood fibre. Techniques in hydroponics: Static solution culture, Continuous-Flow solution culture, Deep water culture, Aeroponics	08
Reference Books:- 1. Bentone Jones, Jr., J. "Complete Guide for Growing Plants Hydroponically." Boca Raton: CRC Press, 2014. 2. Dawson, C. "Practical Research Methods." New Delhi: UBS Publishers, 2002. 3. DeJ, S. C. "Complete Home Gardening." Jodhpur: Agrobias, 2003. 4. Dubey, R. C. "A Textbook of Biotechnology." New Delhi: S. Chand & Co., 2005.		
Evaluation Pattern:		
Total Marks: 50		
Internal Evaluation:(20 Marks): • CCE-1: Home Assignment: 10 Marks • CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks • CCE-III: MCQ Test :10 Marks Note: Internal evaluation (Best of two CCE Marks will be considered)		End Semester Examination: (30Marks): • Question-1: Solve the following questions (five questions of 2 marks) 10 M • Question-2: Attempt any two questions (three questions of 10marks) 20 M • Question-3: Attempt any four questions (five questions of 5 marks) 20 M Note: Conversion of 50 marks of ESE to 30 marks

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	Programme: B.Sc	Semester - III
	Type : DSC VI (Minor-II)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Industrial Botany (BBT 235)		
Course Objectives: The students should be able to... 1. Understand the role of plants in human welfare. 2. Recognize the industrial applications of plant resources. 3. Stay updated on plant-dependent industries and their relevance. 4. Foster entrepreneurial thinking and inspire students to consider start-ups in plant-based industries		
Course Outcomes: The students will be able to... 1. Analyze and explain the role of plants in human welfare. 2. Identify and describe the industrial applications of plant resources. 3. Recognize and list plant-dependent industries. 4. Discuss ideas related to plant-based entrepreneurship and start-ups.		
Module	Title and Contents	Hrs
Module -1	Module -1: Utilization of Plants 1.1 Plant resources utilization: Introduction, Food, fodder, fibers, medicines, timber, dyes, gum, tannins (Two examples of each resource) 1.2 Relevant industries associated with the above plant resources 1.3 Industrial Mycology: Important genera of fungi used in various industries and their products [<i>Penicillium</i> , <i>Aspergillus</i> , and <i>Saccharomyces</i> (yeast)] 1.4 Mushroom cultivation: Plant resources, cultivation practices of Oyster mushroom (<i>Pleurotus</i> sps.), uses of mushrooms, value-added products	07
Module -2	Module -2: Bio-Fertilizers and Bio-Control 2.1 Biofertilizers: concept and need, Types of bio-fertilizers, Nitrogen fixing biofertilizer: <i>Azotobacter</i> , <i>Rhizobium</i> , BGA (<i>Nostoc</i> , <i>Anabaena</i>), <i>Azolla</i> , Phosphorus solubilizing bacteria and Mycorrhiza, Potash mobilizing bacteria. 2.2 Bio-control: Introduction, sources, and advantages 2.3 Important commercial products – Source, preparation, and uses of Pyrethrins, Azadiractin, <i>Trichoderma</i> , <i>Trichogramma</i>	08

Module -3	Module -3: Plant Pharmaceutical Industry 3.1 Introduction, Scope and Advantages. 3.2 Types of pharmaceutical products: Churna, Asava, and Arishta, Drug plants with reference to the botanical source, active principles, and medicinal uses of <i>Adathoda zeylanica</i> , <i>Tinospora cordifolia</i> , and <i>Asparagus racemosus</i> . <i>Curcuma Longa</i> 3.3 Manufacture of Churna (<i>Triphala churna</i>), Arishta (Ashokarishta), and Asava (Kumariasava). 3.4 Concept of nutraceuticals and cosmeceuticals with examples 3.5 Commercial significance of Amla and Aloe.	07
Module -4	Module -4: Fruit Processing Industry 4.1 Fruit processing: Introduction, scope and need 4.2 Fruit Processing Process 4.3 Types of fruit processing with examples (canned fruits, dried fruit chips, fruit pulp, squash, jam, jelly, pickle and ketchups, Jaggery).	08

Reference Books:-

1. Deshmukh, L. P. "Medicinal Plants of India." New Delhi: Oxford Book Co., 2013.
2. Drury, C. H. "Ayurvedic Useful Plants in India." New Delhi: Asiatic Publishing House, 2006.
3. Gupta, M. K. "Handbook of Organic Farming and Biofertilizers." Jaipur: ABD Publisher, 2007.
4. Hui, Y. H. "Handbook of Fruits and Fruit Processing." 4 Aug. New York: John Wiley & Sons, 2008.
5. Kocchar, S. L. "Economic Botany in Tropics." 4th ed. New Delhi: Macmillan India Ltd., 2011.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation:(20 Marks):

- CCE-1: Home Assignment: 10 Marks
- CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks
- CCE-III: MCQ Test :10 Marks

Note: Internal evaluation (Best of two CCE Marks will be considered)

End Semester Examination:(30Marks):

- Question-1: Solve the following questions (five questions of 2 marks) 10 M
- Question-2: Attempt any two questions (three questions of 10 marks) 20 M
- Question-3: Attempt any four questions (five questions of 5 marks) 20 M

Note: Conversion of 50 marks of ESE to 30 marks



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Botany

Programme: B.Sc

Semester - III

Type: DSC P (Minor Practical-I)

Marks: 50

Credits: 2

From: A. Y. 2025-26

Name of the Course: Minor Practical-I (BBP 236)

(Practical Course based on Courses BBT 234 & 235)

Course Objectives: The students should be able to...

1. Understand and explain the different methods of plant propagation.
2. Demonstrate various practices followed in plant nurseries.
3. Comprehend the knowledge and skills required for managing plant nurseries.
4. Understand the role of plants in human welfare and their importance.

Course Outcomes: The students will be able to...

1. Develop plant seedlings using vegetative propagules.
2. Demonstrate the micropropagation technique for plant propagation.
3. Set up a hydroponics system for efficient plant propagation.
4. Analyze the commercial aspects of plant propagation in the market.

Practical No.	Title and Contents (Any 15 of the following)	Hrs
1	Study of vegetative modes of propagation (bulbs, bulbils, corms, rhizomes, tubers, runners, suckers, stolons, epiphyllous buds)	04
2	Study of plant propagation by herbaceous/ soft wood/semi hard wood/hard wood cuttings	04
3	Study of plant propagation by layering technique.	04
4	Study of plant propagation by grafting technique	04
5	Study of plant propagation by budding technique	04
6	Preparation of culture tubes, culture bottles and liquid cultures for plant tissue Culture	04
7	Preparation and inoculation of explants in culture medium.	04

8	Study of plant propagation using hydroponics.	04
9	Study of plant resources in industries: medicine, timber, and gum (Two examples of each)	04
10	Study of plant resources in industries: food, fodder, fiber (Two examples of each)	04
11	Cultivation of <i>Oyster</i> mushroom and demonstration of various stages	04
12	Study of types of Bio-fertilizers: <i>Rhizobium</i> , <i>Azotobacter</i> , BGA, <i>Azolla</i>	04
13	Preparation of Jam jelly and Squash.	04
14	Study of canned fruits, dried fruit chips, fruit pulp pickle and ketchups	04
15	Preparation of Churna (<i>Triphala churna</i>), Arishta (Ashokarishta), and Asava (Kumariasava).	04
16	Study of industrially important fungi and their products. Aspergillus: citric acid; Yeast: Bakery products; Penicillium: Penicillin	04
17	Study of plant resources used in biopesticides. (Pyrethrins, Azadiractin, <i>Trichoderma</i> , <i>Trichogramma</i>)	04
18	Study of Botanical source, active principles, and medicinal uses of <i>Adathoda zeylanica</i> , <i>Tinospora cordifolia</i> , and <i>Asparagus racemosus</i> .	04
19	One botanical excursion to study plant diversity. Visit to one of the following industries. (Study/project report is compulsory). -Fruit Processing unit/ Pharmaceutical industry / plant tissue culture laboratory / Nursery	04

Reference Books:-

1. Bentone Jones, Jr., J. "Complete Guide for Growing Plants Hydroponically." Boca Raton: CRC Press 2014.
2. Dawson, C. "Practical Research Methods." New Delhi: UBS Publishers, 2002.
3. Drury, C. H. "Ayurvedic Useful Plants in India." New Delhi: Asiatic Publishing House, 2006.
4. Field, and Xenia. "Planning and Planting Designs of Home Gardens." New Delhi: ICAR, 1965.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - III
	Type : Vocational Skill Course-I	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Advanced Botanical Skills Part-I (Microtechniques, Slide preparation & Staining Techniques) (BBPVSC I)		
Course Objectives: The students should be able to... 1. Acquire basic knowledge of microtechniques used in plant sciences. 2. Understand the techniques for preparing slides in microscopy. 3. Recognize various staining techniques and their applications in plant sciences. 4. Understand the practical applications of microtechniques in plant research.		
Course Outcomes: The students will be able to... 1. Utilize various microscopy techniques effectively. 2. Gain basic knowledge of different staining techniques. 3. Apply microtechniques in various fields of plant sciences. 4. Acquire practical knowledge and hands-on experience with microtechniques.		
Practical No.	Title and Contents (Any 15 of the following)	Hrs
1	Study of various fixation techniques in plant sciences.	04
2	Study of various staining techniques in plant sciences.	04
3	Study of various clearing and mounting medium used in plant sciences.	04
4-6	Study of various instrument which are used in Microtechniques (Microphotography, Scanning Electron Microscopy, Microtome, Centrifuge)	04
7	Study of mitosis in <i>Allium cepa</i> roots	04
8	Study of meiosis in <i>Allium cepa</i> flower buds.	04

9	Isolation of DNA from suitable plant specimen	04
10-11	Study of different types of Microscopy (Light microscopy, fluorescence microscopy and light microscopy).	04
12	Study of methods of slide preparation (whole mount, smear, squash and section).	04
13	Study of preparation of permanent slides.	04
14	Isolation of protoplast from given plant specimen.	04
15	Study of Methods of microscopic measurement and data processing.	04
16	Study of maceration techniques in plants.	04
17	Study of different pre-treating agents used for chromosome separation.	04
18	Study of Isolation of Chloroplast.	04

Reference Books:-

1. Archana Sharma. "Chromosome Techniques: A Manual." 2020.
2. Berlyn, G. P., and J. P. Miksche. "Botanical Microtechnique and Cytochemistry." Ames: Iowa State University Press, 1976.
3. Fowke, L. C., and P. J. Rennie. "Botanical Microtechnique for Plant Cultures." In "Plant Cell, Tissue and Organ Culture," edited by O. L. Gamborg and G. C. Phillips. Springer Lab Manual. Berlin: Springer, 1995.
4. Johansen, Donald Alexander. "Plant Microtechnique." New York: McGraw-Hill Book, 1940.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Botany

Programme: B. Sc.

Semester -III

Type: Skill Enhancement Course Practical I

Marks: 50

Credits: 2

From: A. Y. 2025-26

**Name of the Course: Botanical Illustrations and Photography
(BBPSEC-I)**

Course Objectives:

1. Understand the fundamentals of photography and its significance.
2. Identify the equipment required for effective photography.
3. Understand copyright issues and legal aspects related to photography.
4. Develop photography skills, incorporating scientific perception and attention to detail.

Course Outcomes:

1. Recognize the different equipment required for photography.
2. Capture photographs of plants both in the laboratory and in the field from a scientific perspective.
3. Conduct photography sessions of plants with professional skill and finesse.
4. Comprehend and apply copyright regulations when taking photographs of plants.

Practical No.	Title and Contents (Any 15 of the following)	Hrs.
1	Study of habit of Plants.	04
2	Study of various leaf shapes, margins, and venation patterns.	04
3	Morphological study of complete flower.	04
4	Study of different types of fruits and seeds.	04
5	Comparative study of plant species using both drawings and photos.	04
6	Study of types of camera and accessories.	04
7	Study of photography and its types.	04
8	Study of Indoor and outdoor Photo Shoots.	04
9	Study of image processing using AI.	04
10	Study of Light and shadow as requirements in photography.	04
11	Study of color and Black & White Photography.	04

12	Study of Digital Photography.	04
13	Study of Processing of digital photographs.	04
14	Study of Macro photography.	04
15	Study of Micro photography.	04
16	Study of Labelling of Photographs.	04
17	Ethics in photography and nature photography.	04
18	Preparation of exhibition of botanical illustrations and photographs.	04

Reference Books: -

- 1) Broll, B. "Microcosmos: Discovering the World through Microscopic Images from 20 X to Over 20 million X Magnification". Firefly books, 2010
- 2) Gerlach, J., Gerlach, B. "Digital Wildlife Photography". Focal Press, Taylor and Francis Group. 2013
- 3) Harnischmacher, C. "Complete guide to Macro and Close-up Photography". Rocky Nook, 2016
- 4) Saikia, N. "Art and Indian Copyright Law- A statutory Reading". 2015
- 5) Shaw, J. "Nature Photography Field Guide". Amphoto Books, Crown Publishing Group, NewYork, 2000

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - III
	Type : IKS II	Marks: 50
	Credits : 2	From: A. Y. 2025-26
	Name of the Course: Indian Agriculture (BBTIKS II)	
Course Objectives: The students should be able to...		
1. Understand traditional agricultural practices followed in India. 2. Appreciate the glorious history of Indian agriculture. 3. Gain knowledge about ancient agricultural techniques and their applications. 4. Compare and analyze the trends in ancient, medieval, and modern agricultural practices.		
Course Outcomes: The students will be able to...		
1. Describe ancient indian agriculture and compare various ancient agricultural traditions with contemporary practices. 2. Explain and demonstrate the irrigation techniques used in india. 3. Evaluate the effectiveness of different agricultural technologies implemented in india. 4. Compare the Indian attitude towards agriculture throughout different periods in history.		
Module	Title and Contents	Hrs
Module -1	Module -1: History of Indian Agriculture 1.1 Introduction and importance of Agriculture in India 1.2 History of Indian agriculture: The significance of agriculture and irrigation as emphasized in the Indian Mythological texts like Ramayana, Mahabharata and other. Mention of Indian agriculture by Greek historians and later travelers.	07
Module -2	Module -2: Ancient Irrigation Techniques 2.1 Significance of Agriculture and irrigation for the Kings of Indian tradition. 2.2 Major water bodies of ancient times. The Ery system of south India.	08

Module -3	Module -3: Indian Agriculture Technologies 3.1 Excellence of Indian agricultural technologies as observed by more recent European observers. 3.2 Productivity of Indian agriculture in medieval Thanjavur and eighteenth-century Allahabad, Chengalpattu, etc.	08
Module -4	Module -4: Agriculture and Indian Society 4.1 Indian attitude towards agriculture in ancient times. 4.2 Indian attitude towards agriculture in medieval times. 4.3 Indian attitude towards agriculture in modern times.	07

Reference Books:-

1. Agarwal, A., and S. Narain. "Dying Wisdom: Rise, Fall and Potential of India Traditional Water-Harvesting Systems." New Delhi: Centre for Science and Environment, 1997.
2. Basu, R. N., T. K. Bose, and C. S. Chakraborty. "History of Science in India - Agricultural Science (Volume V)." The National Academy of Science, India (NASI) & The Ramakrishna Mission Institute of Culture, India, 2017.
3. Bhadani, B. L. "Water Harvesting, Conservation and Irrigation in Mewar (AD 800-1700)." New Delhi: Manohar Publishers & Distributors, 2012.
4. Bunce, F. W. D. K. "The Iconography of Water: Well and Tank Forms of the Indian Subcontinent." New Delhi: Printworld Pvt. Ltd., 2013.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation:(20 Marks):

- CCE-I: Home Assignment: 10 Marks
- CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks
- CCE-III: MCQ Test: 10 Marks

Note: Internal evaluation (Best of two CCE Marks will be considered)

End Semester Examination:(30Marks):

- Question-1: Solve the following questions (five questions of 2 marks) 10 M
- Question-2: Attempt any two questions (three questions of 10marks) 20 M
- Question-3: Attempt any four questions (five questions of 5 marks) 20 M

Note: Conversion of 50 marks of ESE to 30 marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - IV
	Type : DSC VII (Major III)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
	Name of the Course: Plant Embryology (BBT 241)	
Course Objectives: The students should be able to...		
1. Know the basic knowledge of flower structure in angiosperms. 2. Imbibe basic knowledge about the processes of pollination. 3. Understand the basic knowledge about the process of fertilization. 4. Study the basic knowledge of embryo development.		
Course Outcomes: The students will be able to...		
1. Explain the structural organization of a typical angiosperm flower, functions of pollination, and different processes of pollination. 2. Understand the concepts of microsporogenesis, megasporogenesis, and fertilization in angiosperms. 3. Understand the process of embryo development and the variations found in the process. 4. Imbibe the different concepts in embryology such as polyembryony, apomixis, and parthenocarpy and their applications.		
Module	Title and Contents	Hrs
Module -1	Module -1: Structural Organization of Flower 1.1 Structure of typical flower. 1.2 Structure of typical androecium. 1.3 Types of anthers, adhesion, cohesion, adalphy, epipetalous, epiphyllous. 1.4 Structure of bisporangiate anther, tetrasporangiate anther and pollen grain. 1.5 Structure of gynoecium; parts of carpel, syncarpus, apocarpus, types of style. 1.6 Structure of ovule, types of ovules. 1.7 Concept of flower as a modified Shoot.	07
Module -2	Module -2: Pollination and Fertilization 2.1 Definition, types and mechanism in Anemophily (<i>Zea mays</i>), Entomophily (<i>Calotropis</i>) and Hydrophily (<i>Vallisneria</i>). 2.2 Pollen germination and male gametophyte; megasporogenesis.	08

	2.3 Structure of embryo sac: Monosporic (<i>Polygonum</i>) and Bisporic (<i>Allium</i>); fertilization: Entry of pollen tube (Chalazogamy, mesogamy, porogamy). 2.4 Double fertilization and triple fusion. Significance of double fertilization.	
Module -3	Module -3: Embryo and Endosperm Development 3.1 Structure and development of embryo in Monocotyledons and Dicotyledons. 3.2 Development of endosperm, Types of endosperms- Nuclear, Helobial and Cellular.	07
Module -4	Module -4: Polyembryony, Apomixis and Parthenocarpy 4.1 Polyembryony: Introduction, Types - True polyembryony (Cleavage and Adventive), false polyembryony, Causes of polyembryony, Significance of polyembryony. 4.2 Apomixis – Introduction causes of Apomixis, Types – Gametophytic & Sporophytic, Significance of Apomixis with respect to parthenocarpy. 4.3 Apomixis and its Application in Crop Improvement. 4.4 Industrial applications of polyembryony.	08
Reference Books:- 1. Datta, S. C. "Systematic Botany." New Delhi: New Age International Publishers, 1989. 2. Maheshwari, P. "An Introduction to Embryology of Angiosperms." New Delhi: Tata McGraw Hill Publishing Co., 1950. 3. Nair, P. K. K. "Essentials of Palynology." New Delhi: Today & Tomorrow's Printers and Publishers, 1985. 4. Raghvan, V. "Developmental Biology of Flowering Plants." New York: Springer-Verlag, 2000.		
Evaluation Pattern:		
Total Marks: 50		
Internal Evaluation:(20 Marks): • CCE-1: Home Assignment: 10 Marks • CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks • CCE-III: MCQ Test :10 Marks Note: Internal evaluation (Best of two CCE Marks will be considered)		End Semester Examination:(30Marks): • Question-1: Solve the following questions (five questions of 2 marks) 10 M • Question-2: Attempt any two questions (three questions of 10marks) 20 M • Question-3: Attempt any four questions (five questions of 5 marks) 20 M Note: Conversion of 50 marks of ESE to 30 marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - IV
	Type : DSC VIII (Major-IV)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Plant Ecology & Environment (BBT 242)		
Course Objectives: The students should be able to... 1. Understand the fundamental concepts of ecology and the factors affecting ecosystems. 2. Gain knowledge of biogeochemical cycles and recognize their ecological significance. 3. Develop an understanding of major ecosystems across the globe. 4. Comprehend the interrelationships between biotic (living) and abiotic (non-living) components of the environment.		
Course Outcomes: The students will be able to... 1. Composition and structure. 2. Apply core ecological principles to analyze and address current conservation issues. 3. Critically evaluate scientific literature from the field of ecology. 4. Identify and explain abiotic and biotic factors influencing ecosystem structure and function.		
Module	Title and Contents	Hrs
Module -1	Module -1: Ecological Factors and Adaptations 1.1 Introduction, Definition and Scope of Ecology. 1.2 Ecological Factors: Edaphic factors: Soil- Origin and formation, Composition, soil profile. 1.3 Climatic factors: Light and Temperature as ecological factors. 1.4 Ecological Adaptations: Ecological adaptations in Hydrophytes, Xerophytes, Mesophyte , Halophyte, Epiphytes and parasites.	07
Module -2	Module -2: Plant Communities and Succession 2.1 Plant Communities: introduction, general characters, forms and structure, Raunkier's life forms. 2.3 Plant Succession: characters, process and types – Hydrosere, Xerosere.	08

Module -3	Module -3: Ecosystem and phytogeography 3.1. Ecosystem: Introduction, Definition, Composition and Food Chain. 3.2 Ecological pyramids - Number, Biomass and Energy with suitable example. 3.4. Biogeochemical cycles - Introduction, Phosphorus and Nitrogen cycle. Phytogeographical regions in India as per Chatterji and Mani.	08
Module -4	Module -4: Phytoremediation 4.1. Concept and scope; Types of remediation (bioaccumulation, rhizofiltration, rhizoextraction). 4.2. Phytoremediation of dyes, chemicals and heavy metals.	07
Reference Books:- 1. Ambasht, R. S. "A Textbook of Plant Ecology." CBS Publishers and Distributors, 2017. 2. Agarwal, S. K. "Fundamentals of Ecology." New Delhi: APH Publishing Corporation, 2008. 3. Krens, C. J. "Ecology: The Experimental Analysis of Distribution and Abundance," 3rd ed. New York: Harper and Row Publishers, 1985. 4. Kormondy, E. J. "Concepts of Ecology." New Jersey: Prentice Hall Publishing Company, 1996		
Evaluation Pattern:		
Total Marks: 50		
Internal Evaluation:(20 Marks): • CCE-1: Home Assignment: 10 Marks • CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks • CCE-III: MCQ Test: 10 Marks Note: Internal evaluation (Best of two CCE Marks will be considered)		End Semester Examination: (30Marks): • Question-1:Solve the following questions (five questions of 2 marks) 10 M • Question-2: Attempt any two questions (three questions of 10marks) 20 M • Question-3: Attempt any four questions (five questions of 5 marks) 20 M Note: Conversion of 50 marks of ESE to 30 marks



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Botany

Programme: B.Sc

Semester - IV

Type : DSC P (Major Practical II)

Marks: 50

Credits : 2

From: A. Y. 2025-26

Name of the Course: Major Practical-II (BBP 243)
(Practicals based on theory Course BBT 241 & 242)

Course Objectives: The students should be able to...

1. Identify local plant species and understand the basic principles of plant classification and identification.
2. Analyze morphological and anatomical variations in plants, and understand how these differences contribute to plant function and survival.
3. Apply experimental techniques to study plant physiology, including aspects like photosynthesis, respiration, and water uptake.
4. Engage in experiential learning through hands-on practicals, helping to solidify theoretical knowledge.

Course Outcomes: The students will be able to...

1. Identify the structure and characteristics of a typical angiosperm flower.
2. Explain the fundamentals of pollen biology, types of gynoecium and ovules, and the development of the embryo and endosperm.
3. Demonstrate knowledge of various physiological processes in plants and apply techniques used in plant physiology.
4. Operate meteorological instruments and analyze edaphic (soil-related) factors.

Practical No.	Title and Contents (Any 15 of the following)	Hrs
1	Study of typical flower	04
2	Structure of young / mature anther by permanent slides and slide preparations.	04
3	Study of germination of pollen grains.	04
4	Detection of pollen viability by staining technique.	04
5	Study of types of anthers (Stamens) Androecium	04

6	Study of types of Gynoecium in angiosperms.	04
7	Study of types of ovules (by permanent slide or photograph).	04
8	Study of dicotyledon embryo and monocotyledon embryo (by permanent slide or photograph).	04
9	Dissection of embryo / endosperm from any suitable developing seeds	04
10	Identification of types embryo sac and types of endosperms	04
11	Study of Meteorological Instruments	04
12	Study of pH of soils.	04
13	Study of Water Holding Capacity of soils	04
14	Study of morphological and anatomical adaptations in Hydrophytes - <i>Hydrilla</i> , <i>Eichhornia</i> .	04
15	Study of morphological and anatomical adaptations in Xerophytes - <i>Aloe</i> , <i>Nerium</i> .	04
16	Study of morphological and anatomical adaptations in Epiphytes (Orchid) and Parasites, (<i>Cuscuta</i>).	04
17	Study of Ecological pyramids based on the field data / given data.	04
18	Study of phytogeographical regions of India using standard maps.	04
19	Study of types of food chain	04
20	Study of soil texture	04

Reference Books:-

1. Bendre, A. "Practical Botany." Meerut: Rastogi Publications, 2010.
2. Lawrence, G. H. M. "Taxonomy of Vascular Plants." New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd., 1951.
3. Pandey, B. P. "Modern Practical Botany," Vol. I. New Delhi: S. Chand and Company Ltd., 2011.
4. Pandey, B. P. "Modern Practical Botany," Vol. II. New Delhi: S. Chand and Company Ltd., 2011

Evaluation Pattern

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - IV
	Type : DSC VII (Minor-III)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Green House Technology (BBT 244)		
Course Objectives: The students should be able to... 1. Understand the fundamentals and principles of greenhouse technology. 2. Operate and maintain an established greenhouse environment effectively. 3. Identify the specific needs and requirements of crop plants grown in greenhouses. 4. Demonstrate the ability to cultivate various crop plants within a controlled greenhouse setting.		
Course Outcomes: The students will be able to... 1. Identify the basic requirements for establishing a greenhouse. 2. Maintain and manage greenhouse operations efficiently. 3. Apply appropriate fertilizers based on crop needs within the greenhouse environment. 4. Cultivate a variety of crop plants using greenhouse techniques.		
Module	Title and Contents	Hrs
Module -1	Module -1: Fundamentals of Green House 1.1 Introduction to Green House, scope and importance Types of protected structures – Low-cost structures – Greenhouse 1.2 Poly house – Polytunnels – Net house 1.3 Erection of Greenhouse Structures; Covering with nets and shades (Types of glazing material and its characteristics)	07
Module -2	Module -2: Maintenance of green house 2.1 Maintenance of erected structures 2.2 Maintenance of operational elements of the greenhouse for periodic checking, tightening, greasing.	08

Module -3	Module -3: Factors responsible for crop growth in protected cultivation 3.1 Role soil factors: Soil temperature, pH and Electrical conductivity (EC) maintenance. 3.2 Micro and Macro nutrient content – Organic carbon content - Cation exchange capacity (Sodium and Ammonium Acetate, Centrifuge Method) 3.3 Environmental factors in protected cultivation: Light intensity and air temperature 3.4 Relative humidity (RH) and CO ₂ concentration, Air movement mechanism Carbon sequestration	07
Module -4	Module -4: Protected Cultivation Techniques for crop plants 4.1 Tomato: Protected cultivation techniques –Introduction, Varieties, Soil, Climate, Field preparation, Season and planting 4.2 Cabbage: Protected cultivation techniques – Introduction, Varieties, Soil, Climate, Field preparation, Season and planting 4.3 Gerbera: Protected cultivation techniques Introduction, Varieties, Soil, Climate, Field preparation, Season and planting	08

Reference Books:-

1. Bose, T. K., and L. P. Yadav. "Commercial Flowers." Kolkata: Naya Prakash, 1992.
2. Mane, M. S., B. L. Ayare, and S. S. Magar. "Principles of Drip Irrigation System." New Delhi: Jain Brothers.
3. Mane, M. S., and B. L. Ayare. "Principles of Sprinkler Irrigation." New Delhi: Jain Brothers.
4. Prasad, S., and U. Kumar. "Greenhouse Management of Horticultural Crops," 2nd ed. Jodhpur: Agrobios, 2003.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation:(20 Marks):

- CCE-I: Home Assignment: 10 Marks
- CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks
- CCE-III: MCQ Test:10 Marks

Note: Internal evaluation (Best of two CCE Marks will be considered)

End Semester Examination:(30Marks):

- Question-1: Solve the following questions (five questions of 2 marks) 10 M
- Question-2: Attempt any two questions (three questions of 10marks) 20 M
- Question-3: Attempt any four questions (five questions of 5 marks) 20 M

Note: Conversion of 50 marks of ESE to 30 marks

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - IV
	Type : DSC VIII (Minor-IV)	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Agri-tourism (BBT 245)		
Course Objectives: The students should be able to... 1. Introduce the basic concepts and significance of agritourism. 2. Create awareness of the various perspectives and dimensions of agritourism. 3. Understand the role of value-added products in enhancing both tourism experiences and agricultural product markets. 4. Identify diverse career opportunities within the fields of agritourism and agri-based enterprises.		
Course Outcomes: The students will be able to... 1. Define agri-tourism and food tourism, and articulate current trends and shifting demographic influences. 2. Discuss interdisciplinary academic approaches, theories, and critical perspectives related to tourism. 3. Explain the regulatory framework, challenges, key organizations, and partnerships essential for small-scale farmers engaging in tourism ventures. 4. Identify diverse career opportunities within the fields of tourism and agri-tourism.		
Module	Title and Contents	Hrs
Module -1	Module -1: Introduction to Agri-tourism 1.1 Concept of agri-tourism-definition, nature and scope of agri tourism. 1.2 Needs and opportunities of agri-tourism. 1.3 Agri-Tourism and Traditional Tourism. 1.4 Types of Agri-tourism	07
Module -2	Module -2: Factors affecting agri-tourism 2.1 Location for agri-tourism centre. 2.2 Geographical factors: relief, climate, drainage pattern, soil. 2.3 Socio-economic factors: Capital, transportation facilities, market, and holding of farmers, tradition, cropping pattern. 2.4 Export and Import Crops in Agritourism 2.5 GI-Related Crops	08

Module -3	Module -3: Establishment of agri-tourism centre 3.1 Enlisting and Understanding Daily activities in the agriculture farm/Agri-Tourism centers like. i. Animal Feeding, Guided field visits and tour, Watching domestic animals, Harvest Festival. 3.2 Rural Festival/Jatra, Farmer's markets, Milking the Cow and Buffalos, Religious Temple visits. 3.3 Swimming at well, ponds, or river, fishing, Local site seeing 3.4 Rural games to be demonstrated and played- Bullock cart, Bicycle, Tractor rides. Vittidandu, Surparambhya, Kabaddi, Langadi, Kho-Kho, Bullock ploughing, Lagore & Gallori. 3.5 Arranged adventure Activities like mountaineering, trekking, river crossing, cycling etc	07
Module -4	Module -4: Concerns of Agri-tourism 4.1 Who Can Start Agri-Tourism Centers. 4.2 Requirements for Agri-Tourism Centers- Infrastructure Facilities, livestock, Recreation facilities, 4.3 Agri-tourism policies. 4.4 Benefits of Agri-Tourism Centers. 4.5 Problems of the Agri-Tourism centers.	08

Reference Books:-

1. Dev, M. S. "Agricultural Policy Framework for Maharashtra: Issues and Options." Proceeding/Project Report No. 21. Mumbai: Indira Gandhi Institute of Development Research, 1996.
2. D., M., and R. J. Reeder. "Farm-Based Recreation: A Statistical Profile." Washington, DC: USDA Economic Research Service, 2007.
3. Goeldner, C. R., and B. J. Brent Ritchie. "Tourism: Practices, Principles and Philosophies." London: John Wiley and Sons, 2011.
4. Holloway, J. C. "The Business of Tourism." London: Prentice Hall, 2002.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation:(20 Marks): • CCE-1: Home Assignment: 10 Marks • CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks • CCE-III: MCQ Test :10 Marks Note: Internal evaluation (Best of two CCE Marks will be considered)	End Semester Examination:(30Marks): • Question-1: Solve the following questions (five questions of 2 marks) 10 M • Question-2: Attempt any two questions (three questions of 10marks) 20 M • Question-3: Attempt any four questions (five questions of 5 marks) 20 M Note: Conversion of 50 marks of ESE to 30 marks
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	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Botany		
	Programme: B.Sc		Semester - IV
	Type :DSC P (Minor Practical II)		Marks: 50
	Credits : 2		From: A. Y. 2025-26
	Name of the Course: Minor Practical II (BBP 246) (Practicals based on Theory Course BBT 244 & 245)		
Course Objectives: The students should be able to...			
1. Enhance their understanding of agri-tourism and explore its potential to generate economic opportunities. 2. Acquire knowledge of essential tools and techniques used in agri-tourism practices. 3. Learn the cultivation methods for various edible mushrooms. 4. Gain familiarity with the climatic requirements necessary for successful mushroom cultivation.			
Course Outcomes: The students will be able to...			
1. Define agro-tourism and food tourism, and articulate emerging trends and changing demographic patterns. 2. Discuss interdisciplinary academic approaches, theories, and critical perspectives related to tourism. 3. Demonstrate the ability to initiate a small-scale mushroom cultivation enterprise. 4. Evaluate the prospects and scope of mushroom cultivation as a viable small-scale industry.			
Practical No.	Title and Contents (Any 15 of the following)		Hrs
1	Preparation of compost.		04
2	Study of media preparation and fumigation.		04
3	Preparation of layout of greenhouse.		04
4	Study of structure of green houses.		04
5	Study of environmental factor influencing greenhouse material.		04
6	Study of different equipments used in green house.		04
7	Study of different nutrient deficiency symptoms in crop plants.		04

8	Study of preparation and application of different nutrient Fertilizers used in greenhouse.	04
9	Study of preparation and application of different pesticides used in greenhouse.	04
10	Study of types of protected structures / components of green house and covering materials.	04
11	Study of types of glazing material and its characteristics.	04
12	Study of Protected cultivation techniques for any suitable plants.	04
13	Visit to commercial green house and poly house unit/phytotron/ nursery facilities.	04
14	List out the main content of the packages tour – Report.	04
15	Prepare a model package tour of your own – Report.	04
16	Draw chart with comparative statements of all components involved in tour package costing and pricing – Report	04
17	Agri-tourism business plan development and design.	04
18	Case study of Agri-tourism in the nearby area.	04

Reference Books:-

1. Ahlawat, O. P., and R. P. Tewari. "Cultivation Technology of Paddy Straw Mushrooms." Chambaghat, Solan, India: National Research Centre for Mushroom (ICAR), 2007.
2. Gogoi, R., Y. Rathaiah, and T. R. Borah. "Mushroom Cultivation Technology." Jodhpur, India: Scientific Publishers, 2006.
3. Goeldner, C. R., and B. J. Brent Ritchie. "Tourism: Practices, Principles and Philosophies." London: John Wiley and Sons, 2011.
4. Holloway, J. C. "The Business of Tourism." London: Prentice Hall, 2002.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - IV
	Type : Vocational Skill Course-II	Marks: 50
	Credits : 2	From: A. Y. 2025-26
	Name of the Course: Advanced Botanical Skills Part-II (Plant Collection, Identification & Preservation) (BBPVSC II)	
Course Objectives: The students should be able to...		
1. Acquire foundational knowledge about plant collection methods and principles.		
2. Understand various techniques used for the preservation of plant specimens.		
3. Learn and apply different plant collection methods.		
4. Explore the practical applications of plant identification in research and conservation.		
Course Outcomes: The students will be able to...		
1. Recognize various microscopy techniques and their applications.		
2. Understand the fundamental principles of staining techniques.		
3. Apply microtechniques in diverse fields, including research and diagnostics.		
4. Demonstrate practical proficiency in microtechniques for plant and biological specimen analysis.		
Practical No.	Title and Contents	Hrs
1	Study of various equipments used in collection of plant material.	04
2	Study of Dry and Wet collection method of plant.	04
3	Study of various preservatives used in plant sciences.	04
4	Study of collection of microscopic plants.	04
5	Study of use of flora for identification of plant.	04
6	Preparation of herbarium specimen.	04
7	Study of herbarium preparation of specialized plants.	04
8	Study of poisoning methods of herbarium.	04
9	Identification of genus and species of locally available wild flora.	04

10	Study of different types of field guides (Flora, Monograph, Manual, Icones etc.).	04
11	Study of taxonomic keys.	04
12	Study of Identification of microscopic plants.	04
13	Study of collection, preservation and collection of algae.	04
14	Study of collection, identification and preservation of Wild Mushroom.	04
15	Field trips within and around the Institute campus, compilation of field notes	04

Reference Books: -

1. Bhattacharya, Bharati. "Systematic Botany." Oxford: Alpha Science International, 2009.
2. Bowles, J. M. "Guide to Plant Collection & Identification." Kingston: Queen's University, n.d.
3. Jones, S. B. Jr., and S. E. Luchsinger. "Plant Systematics." 2nd ed. New York: McGraw-Hill, 1986.
4. Sutaria, R. N. "Textbook of Systematic Botany." Mumbai: Ramniklal P. Kothari, 1998.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):

- Journal: 10 Marks
- Students Performance: 10 Marks

End Semester Examination (30 Marks):

- 4 questions



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Botany

Programme: B.Sc

Semester - IV

Type : Skill Enhancement Course-II

Marks: 50

Credits : 2

From: A. Y. 2025-26

Name of the Course: Medicinal Plant Cultivation Techniques (BBPSEC-II)

Course Objectives: The students should be able to...

1. To understand the importance and scope of medicinal plant cultivation.
2. To learn identification, propagation, and cultivation techniques of key medicinal plants.
3. To study soil, climate, and ecological requirements for major species.
4. To apply sustainable and good agricultural practices (GACP).

Course Outcomes: The students will be able to...

1. Identify and classify important medicinal and aromatic plants.
2. Apply scientific cultivation techniques for selected medicinal plant species.
3. Implement sustainable and good agricultural practices (GACP) in medicinal plant farming.
4. Carry out post-harvest processing, storage, and quality assessment of medicinal raw materials.

Practical No.	Title and Contents (Any 15 of the following)	Hrs
1	Identification of common medicinal plants.	04
2	Collection and herbarium preparation of medicinal species.	04
3	Study of preparation of nursery beds and soil media.	04
4	Study of propagation methods – seed, cutting, layering, grafting.	04
5	Study of vegetative propagation of selected medicinal plants.	04
6	Study of transplanting and spacing techniques.	04
7	Study of irrigation and nutrient management.	04
8	Preparation and use of organic manure/compost.	04
9	Identification and control of pests and diseases.	04
10	Study of measurement of growth parameters.	04
11	Study of harvesting and post-harvest handling.	04
12	Study of drying and storage of medicinal plant materials.	04
13	Documentation of Good Agricultural Practices.	04
14	Visit to medicinal plant garden/nursery – report preparation.	04

15	Preparation of cultivation calendar for selected medicinal plants.	04
16	Economic analysis of cultivation and marketing.	04
17	Extraction of essential oils or active ingredients.	04
18	Preparation of herbal formulations (Powder, Decoction, or Ointment)	04
19	Digital documentation and labelling	04

Reference Books: -

- 1) Broll, B. "Microcosmos: Discovering the World through Microscopic Images from 20X to Over 20 Million X Magnification." Firefly Books, 2010.
- 2) Kochhar, S.L. "Economic Botany: A Comprehensive Study." Cambridge University Press, India, 2016.
- 3) Kumar, A., and Singh, A. "Cultivation and Processing of Medicinal Plants." CBS Publishers & Distributors, New Delhi, 2020.
- 4) Nadkarni, K.M. "Indian Materia Medica." Popular Prakashan, Mumbai, 2010.
- 5) Vijayvergia, R. "Practical Manual on Cultivation and Utilization of Medicinal Plants." LAP Lambert Academic Publishing, 2014.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 marks):	End Semester Examination (30 Marks):
• Journal: 10 Marks • Students Performance: 10 Marks	• 4 questions

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B.Sc	Semester - III
	Type : Value Education Course II	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Environmental Studies in Botany (BBTVEC II)		
Course Objectives: The students should be able to...		
1. Understand key environmental issues and their global significance. 2. Relate the laws and regulations that have been enacted to safeguard the environment. 3. Recognize the importance of sustainable development in addressing current and future environmental challenges. 4. Correlate the principles of sustainable development with the field of plant sciences and ecological practices.		
Course Outcomes: The students will be able to...		
1. Explain the causes and impacts of environmental issues. 2. Discuss key concepts related to environmental laws, ethics, and regulations. 3. Examine and discuss the sustainable development goals (SDGS) and their relevance to global sustainability. 4. Compare and analyze the role of plant sciences in achieving the Sustainable Development Goals		
Module	Title and Contents	Hrs
Module -1	Module -1: Environmental issues 1.1 Pollution (Air, Water and Land) 1.2 Fresh-water overuse 1.3 Natural disasters 1.4 Fuel and Energy shortage due to overuse 1.5 Increase in wasteland 1.6 Biodiversity loss 1.7 Global warming and climate change (Causes and intensity of the problem) Role of Botany in creation of environmental issues	10

Module -2	Module -2: Environmental Protection Act 2.1 Environmental Protection Act- 2024 2.2 Wildlife Protection Act, 2022 2.3 Forest Conservation Act, 2023 2.4 Prevention and Control of Pollution Act, 2024. (Air, water and Land), 2.5 From unsustainable to sustainable development, Responsibilities of an Environmentally aware citizen.	07
Module -3	Module -3: Sustainable Development Goals Global sustainable goals with emphasis on environment related Sustainable Development goals	07
Module -4	Module -4: Role of Plant Sciences in meeting the sustainable development goals. Examples and case studies	06

Reference Books:-

1. Agarwal, S. K. "Fundamentals of Ecology." New Delhi: APH Publishing Corporation, 2008.
2. Agarwal, K. C. "Environmental Biology." Bikaner: Nidi Pub. Ltd., 2001.
3. Sharma, P. D. "Ecology and Environment." Meerut: Rastogi Publications, 2007.
4. Odum, E. P., and G. W. Barrett. "Fundamentals of Ecology." California: Thomson Brooks/Cole Publishing, 2005.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation: (20 Marks): • CCE-I: Home Assignment: 10 Marks • CCE-II: Short and long answer questions Test/ Seminar/Open Book Test/Quiz/Case study/ Book review/Field work/ Industry visit: 10 Marks • CCE-III: MCQ Test :10 Marks Note: Internal evaluation (Best of two CCE Marks will be considered)	End Semester Examination:(30Marks): • Question-1: Solve the following questions (five questions of 2 marks) 10 M • Question-2: Attempt any two questions (three questions of 10marks) 20 M • Question-3: Attempt any four questions (five questions of 5 marks) 20 M Note: Conversion of 50 marks of ESE to 30 Marks
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Study Tour/ Excursion:

One teacher along with a batch not more than 20 students is taken for excursions to places of study interest, one in each term. If there are female students in a batch of sixteen, one additional lady teacher is permissible for excursion. Each excursion will not be more than 3 days during college working days. T.A. and D.A. for teachers and non-teaching staff participating in the excursions should be paid as per the rules. The tour report duly certified by the concerned teacher and the head of the department should be submitted at the time of practical examination

