



Karmaveer Bhaurao Patil University, Satara

**Syllabus for
B. Sc. III (Plant Protection)**

**Under
Faculty of Science and Technology
(As per NEP 2020)**

With effect from Academic Year 2026-2027

Syllabus for Bachelor of Science (B. Sc.) Part – III Plant Protection

PREAMBLE:

The B.Sc. Plant Protection course under the autonomy framework will be introduced in the academic year 2026-2027. It has been designed to meet the specific needs of B.Sc. Plant Protection students in accordance with the NEP 2020 guidelines. The curriculum has been developed to reflect the expanding scope of biological sciences. The focus is on equipping students with up-to-date knowledge while maintaining a strong foundation in classical Plant Protection. This approach will enable students to understand and appreciate contemporary interdisciplinary methods in plant science and their contributions to societal development. The course also includes new practical exercises, providing students with hands-on experience with the latest techniques currently in use. Additionally, the course is intended to inspire students to pursue higher studies in Plant Protection, become entrepreneurs, and seek employment in plant-based industries.

GENERAL OBJECTIVES OF THE COURSE:

1. To provide students with a solid foundation in plant science.
2. To foster a scientific mindset, encouraging students to be open-minded, critical, and curious.
3. To develop practical skills in conducting experiments and working with laboratory materials.
4. To help students understand scientific terms, concepts, facts, phenomena, and their interrelationships.
5. To raise students' awareness of natural resources and environmental issues.
6. To equip students with knowledge of plants and related subjects, enabling them to better understand nature and the environment for the benefit of humanity.
7. To empower students to apply their knowledge to enhance agriculture and related fields, promoting self-reliance.

PROGRAMME OUTCOMES

After completing the B.Sc. program, graduates will:

1. Possess a strong foundation of knowledge in their chosen field of study.
2. Develop a scientific mindset, becoming open-minded, critical, and curious, which will support their entry into research and innovation.

3. Be skilled in practical work, experiments, and the use of laboratory materials.
4. Be eligible to pursue higher studies in their field, both in India and abroad.
5. Qualify to appear for examinations for jobs in government organizations.
6. Meet the minimum eligibility requirements for various science-related job opportunities.
7. Be prepared to establish their own entrepreneurial ventures.
8. Enhance critical thinking, develop a scientific attitude, solve problems, improve practical skills, boost communication abilities, and strengthen social interactions.

PROGRAMME SPECIFIC OUTCOMES

After completing the B.Sc. (Plant Protection) program, students will:

1. Be able to explain, describe, discuss, and ask questions about various aspects of plant sciences.
2. Design and conduct experiments related to plant sciences.
3. Critically analyze the interactions between living and non-living entities in their surroundings.
4. Apply knowledge of plant sciences to develop sustainable solutions for both society and industry.
5. Utilize their understanding of plant sciences to become self-reliant, either by securing a job, establishing an agricultural setup, or launching a plant-based entrepreneurial venture.
6. Design and manage projects related to plant sciences.
7. Gain valuable skills in plant-based industries through internships.
8. Enhance research skills through research internships and in-house projects.
9. Present research findings at conferences and in research journals for publication.
10. Critically assess their role in contributing to environmental sustainability goals as responsible citizens.

1. TITLE: **Plant Protection**

2. YEAR OF IMPLEMENTATION: **2026-2027**

3. DURATION: **01 year**

4. PATTERN: **Semester examination**

5. MEDIUM OF INSTRUCTION: **English**

6. STRUCTURE OF COURSE:

As per NEP-2020 (2.0)

Level	Sem.	Course				VSC/ SEC	FP	AEC	CEP/ CC	OJT	Total
		DSC		DSE*							
		T	P	T	P						
5.5	V	DSC I (2)	DSC P (2)	DSE I (2)	DSE P (2)	VSC (2)	--	AEC III (2)	CEP (2)	OJT (4)	22
		DSC II (2)									
		DSC III (2)									
5.5	VI	DSC I (2)	DSC P (2)	DSE I (2)	DSE P (2)	VSC (2)	FP (2)	AEC IV (2)	CC (2)	--	22
		DSC II (2)				SEC (2)					
		DSC III (2)									

* DSE - 2 Papers out of four for each semester.

7. COURSE TITLE

1) Fifth Semester

Sr. No.	Course	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits	Course No. & Course Code	No. of Practical Per week	Credits
1.	DSC I	BPPT 351	Plant Morphology and Anatomy	2	2	BPPP 356	1	2
2.	DSC II	BPPT 352	Advances in plant protection	2	2			
3.	DSC III	BPPT 353	Plant-Insect Pests, their Management and Toxicological Studies	2	2			
4.	DSE I	BPPT 354	Plant diseases and their management	2	2	BPPP 357	1	2
5.	DSE I	BPPT 355	Landscaping and Garden Design					
6.	AEC	AEC III	English	2	2	--	--	--
7.	VSC	--	--	--	--	BPPPVSC III	1	2
8.	SEC	--	--	--	--	--	--	--
9.	CEP	--	--	--	--	BPPPCPEP I	1	2
10.	OJT	--	--	--	--	BPPP OJT I	2	4

2) Sixth Semester

Sr. No.	Course	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits	Course No. & Course Code	No. of Practical Per week	Credits
1.	DSC I	BPPT 361	Plant Ecology	2	2	BPPP 366	1	2
2.	DSC II	BPPT 362	Fundamentals of Genetics	2	2			
3.	DSC III	BPPT 363	Laboratory Techniques in plant protection	2	2			
4.	DSE I	BPPT 364	Field Techniques in plant protection	2	2	BPPP 367	1	2
5.	DSE I	BPPT 365	Economically Beneficial Insects.					
6.	AEC	AEC IV	English	2	2	--	--	--
7.	VSC	--	--	--	--	BPPPVSC IV	1	2
8.	SEC	--	--	--	--	BPPPSEC III	1	2
9.	CC	BPPTCP	--	2	2	--	--	--
10.	FP	--	--	--	--	BPPFP I	1	2

8. EVALUATION STRUCTURE:

Semester V (5.5)

Vertical	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BPPT 351	10	10	10	30	50	02
	T	BPPT 352	10	10	10	30	50	02
	T	BPPT 353	10	10	10	30	50	02
	P	BPPP 356	25			25	50	02
DSE (1 Theory Papers Out of 2)	T	BPPT 354	10	10	10	30	50	02
	T	BPPT 355	10	10	10	30	50	02
	P	BPPP 357	25			25	50	02
AEC	T	AEC III	10	10	10	30	50	02
VSC	P	BPPPVSC III	25			25	50	02
CEP	P	BPPPCEP I	25			25	50	02
OJT	P	BPPPOJT I	50			50	100	04
Total							550	22

Semester VI

Vertical	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE-II	CCE-III			
DSC	T	BPPT 361	10	10	10	30	50	02
	T	BPPT 362	10	10	10	30	50	02
	T	BPPT 363	10	10	10	30	50	02
	P	BPPP 366	25			25	50	02
DSE (1 Theory Papers Out of 2)	T	BPPT 364	10	10	10	30	50	02
	T	BPPT 365	10	10	10	30	50	02
	P	BPPP 367	25			25	50	02
AEC	T	AEC IV	10	10	10	30	50	02
VSC	P	BPPPVSC IV	25			25	50	02
SEC	P	BPPPSEC III	25			25	50	02
CC	T	BPPPCC I	10	10	10	30	50	02
FP	P	BPPPPFP I	25			25	50	02
Total							550	22

DSC: Discipline Specific Course; DSE: Discipline Specific Elective; AEC: Ability Enhancement Course; VSC: Vocational Skill Course; SEC: Skill Enhancement Course; OJT: On Job Training; FP: Field Project; CEP: Community Engagement Program; CC: Co-curricular Course; T: Theory; P: Practical

9. 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.



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Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Botany

Programme: B. Sc.

Semester – V

Type: DSC

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course: BPPT 351 Plant Morphology and Anatomy

Course Objectives: By the end of the course, students will be able to:

- 1) Explain the fundamental concepts of crop morphology and their role in identification and classification.
- 2) Describe the structure and types of inflorescences, flowers, and fruits.
- 3) Analyze the organization, classification, and functions of plant tissues.
- 4) Compare the internal structure of monocot and dicot roots, stems, and leaves.

Course Outcomes: By the end of the course, students should be able to:

- 1) Apply morphological principles to identify and classify plants.
- 2) Analyze reproductive structures for distinguishing plant species.
- 3) Classify plant tissues based on their structure and function.
- 4) Evaluate anatomical differences between monocot and dicot plant organs.

Module	Title and Contents	Hrs.
Module 1	Module 1: Crop Morphology 1.1 Introduction, definition: descriptive and interpretative morphology 1.2 Importance in identification, nomenclature, classification, phylogeny, and plant breeding 1.3 Basic concepts of crop form and structure	08
Module 2	Module 2: Morphology of Reproductive Parts 2.1 Inflorescence- Introduction, definition, types and Significance 2.2 Flower: Definition, Parts of a typical flower, floral whorls 2.3 Fruits: Definition and Types of Fruits	07
Module 3	Module 3: Plant Anatomy and Tissues 3.1 Introduction and importance of plant anatomy 3.2 Meristematic tissues: definition, characteristics, functions 3.3 Permanent tissues: i) Simple: parenchyma, collenchyma, sclerenchyma, chlorenchyma, ii) Complex: Xylem and phloem: components and functions, Types of vascular bundles 3.4 Epidermal tissues: Definition, types and function	08

Module 4	Module 4: Internal Organization of Plant Body 4.1 Internal structure of Dicot root and monocot root 4.2 Internal structure of Dicot stem and monocot stem 4.3 Internal structure of Dicot leaf and monocot leaf 4.4 Comparative anatomy and functional significance	07
Reference Books: - 1. Esau, Katherine. <i>Plant Anatomy</i> . New Delhi: Wiley Eastern Ltd., 1993. 2. Esau, Katherine. <i>Anatomy of Seed Plants</i> . New York: John Wiley and Sons, 2006. 3. Fahn, A. <i>Plant Anatomy</i> . Oxford: Pergamon Press, 1974. 4. Gangulee, H. C., K. S. Das, and C. T. Dutta. <i>College Botany</i> . Vol. 1. Kolkata: New Central Book Agency, 2002. 5. Lawrence, G. H. M. <i>Taxonomy of Vascular Plants</i> . Jodhpur: Scientific Publishers (India), 2012. 6. Naik, V. N. <i>Taxonomy of Angiosperms</i> . New Delhi: Tata McGraw-Hill Publishing Company, 1994. 7. Pandey, B. P. <i>Plant Anatomy</i> . New Delhi: S. Chand and Company Ltd., 2007.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3

	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 – V
	Type: DSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 352 Advances in Plant Protection		
Course Objectives: By the end of the course, students will be able to: 1) Develop understanding of economic botany and phytochemical principles, including medicinal plants, pharmacognosy, and plant-based products. 2) Analyze plant–environment interactions, focusing on climate change, soil relationships, and sustainable agriculture. 3) Introduce biostatistics and research methodologies for scientific data analysis and experimental design in plant sciences. 4) Familiarize students with emerging trends such as genome editing, synthetic biology, and biodiversity conservation		
Course Outcomes: By the end of the course, students should be able to: 1) Explain the importance of medicinal plants, phytochemicals, and nutraceuticals in applied plant sciences. 2) Evaluate the impact of environmental factors on plant growth, adaptation, and crop productivity. 3) Apply statistical tools and research techniques for data analysis and interpretation in plant-based studies. 4) Understand and discuss modern technologies like CRISPR, synthetic biology, and climate-smart agriculture		
Module	Title and Contents	Hrs.
Module 1	Module 1: Plant–Environment Interactions 1.1 Plant–microbe interactions (symbiosis, pathogens) 1.2 Climate change and plant adaptation 1.3 Sustainable agriculture & crop resilience 1.4 Soil–plant relationships	08
Module 2	Module 2: Economic Botany & Applied Plant Sciences 2.1 Pharmacognosy: Definition, history, scope and development of Pharmacognosy 2.2 Classification of crude drugs - Alphabetical, biological, morphological, pharmacological, chemical, chemo- taxonomical 2.3 Methods used for separation of phytoconstituents 2.4 Secondary Metabolites: Sources, properties, uses 2.5 Drug adulteration	07

	2.6 Nutraceuticals and plant-based products	
Module 3	Module 3: Biostatistics & Research Methods 3.1 Statistical tools (chi-square, correlation) 3.2 Experimental design in plant research 3.3 Data interpretation and analysis 3.4 Use of software and computational tools	08
Module 4	Module 4: Agricultural Botany 4.1 Agricultural Botany: Scope and Importance 4.2 Soil–Plant Relationships and Mineral Nutrition 4.3 Biofertilizers and Organic Farming 4.4 Crop Improvement and Plant Breeding 4.5 Agricultural Biodiversity and Germplasm Conservation	07
Reference Books: - 1. Odoh, Uchenna E., Shailendra S. Gurav, and Michael O. Chukwuma. <i>Pharmacognosy and Phytochemistry: Principles, Techniques, and Clinical Applications</i>. Wiley, 2025. 2. Mérillon, Jean-Michel, and Kishan Gopal Ramawat, eds. <i>Plant Specialized Metabolites: Phytochemistry, Ecology and Biotechnology</i>. Springer, 2025. 3. Singh, Sachidanand, et al., eds. <i>Green Biotechnology for Herbal and Medicinal Plant Metabolites</i>. CRC Press, 2025. 4. Singh, Sudhir P., et al., eds. <i>Molecular Approaches in Plant Biology and Environmental Challenges</i>. Springer, 2019. 5. Taiz, Lincoln, Eduardo Zeiger, Ian M. Møller, and Angus Murphy. <i>Plant Physiology and Development</i>. Sunderland, MA: Sinauer Associates. 6. Bahadur, Bir, et al., eds. <i>Plant Biology and Biotechnology: Volume I: Plant Diversity, Organization, Function and Improvement</i>. Springer, 2015. 7. Bahadur, Bir, et al., eds. <i>Plant Biology and Biotechnology: Volume II: Plant Genomics and Biotechnology</i>. Springer, 2015. 8. Singh, Deependra, et al., eds. <i>Plant Biotechnology: The Medicinal and Phytopharmaceutical Aspects</i>. CRC Press, 2026.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3

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	Board of Studies in Botany	
	Programme: B. Sc.	Semester – V
	Type: DSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPT 353 Plant-Insect Pests, their Management and Toxicological Studies	
Course Objectives: By the end of the course, students will be able to: 1) Understand major insect pests, their biology, damage, and management. 2) Apply different methods of crop pest management including biological, biotechnological, and chemical approaches. 3) Analyze various classes of insecticides and their mode of action and uses. 4) Evaluate toxicological aspects and safe use of pesticides.		
Course Outcomes: By the end of the course, students should be able to: 1) Identify important insect pests and describe their life cycle, damage, and control. 2) Apply suitable pest management strategies in crop protection. 3) Differentiate insecticides based on formulation, mode of action, and usage. 4) Assess pesticide toxicity, safety measures, and environmental impact.		
Module	Title and Contents	Hrs.
Module 1	Module 1: Plant Insect Pests 1.1 Study of the following insect pests with respect to scientific name, identification, host range, life cycle, nature of damage, and management: • Armyworm of jowar • Pod borer of green pea • Fruit borer of bhendi • Cabbage caterpillar • Leaf miner of groundnut • Mealybugs of custard apple • Whiteflies of guava • Stored grain pests: Indian mealworm, saw-toothed beetle • Polyphagous pests: termites, aphids, Jassids	08
Module 2	Module 2: Management of Crop Pests 2.1 Biological control: concept and suitable examples. 2.2 Biotechnological approaches: concept and applications with examples. 2.3 Chemical control: pesticide formulations (solid, liquid, gaseous), mode of action, uses, and limitations; study of insecticides—	07

	• Botanicals: Pyrethrum, Rotenone • Synthetic pyrethroids: Permethrin, Cypermethrin	
Module 3	Module 3: Chemical Control of Crop Pests 3.1 Study of following insecticides concerning formulations, mode of action, and uses 3.2 Chlorinated hydrocarbons: Lindane, Endosulfan 3.3 Organophosphorus compounds: Acephate, Chlorpyrifos 3.4 Carbamates: Carbosulfan, Methomyl 3.5 Nematicides: Fluensulfone, Fosthiazate 3.6 Rodenticides: Zinc Phosphide, Bromadiolone	08
Module 4	Module 4: Toxicological Study 4.1 Explanation of the following terms: Toxicity, Acute, Chronic, LD- 50, Antidotes, Colour code and Pesticide residue 4.2 Precautions during use of pesticides 4.3 Symptoms of pesticide poisoning 4.4 Pesticide pollution of soil, water and air 4.5 Pesticide legislation in India	07
Reference Books: - 1. Atwal, A. S., and G. S. Dhaliwal. <i>Agricultural Pests of South Asia and Their Management</i> . New Delhi: Kalyani Publishers, 2005. 2. Pedigo, L. P., and M. E. Rice. <i>Entomology and Pest Management</i> . New Delhi: Pearson Education (Indian Edition), 2009. 3. Dhaliwal, G. S., and R. Arora. <i>Integrated Pest Management: Concepts and Approaches</i> . New Delhi: Kalyani Publishers, 2001. 4. Pradhan, S. <i>Insect Pests of Crops</i> . New Delhi: National Book Trust, 1983. 5. Gupta, P. K. <i>Pesticide Toxicology</i> . New Delhi: CBS Publishers & Distributors, 2005.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3

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	Programme: B. Sc.	Semester – V
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 354 Plant diseases and their management		
Course Objectives: By the end of the course, students will be able to: 1) Understand basic concepts, history, importance, and scope of plant pathology. 2) Study major fungal diseases with symptoms, causes, and management. 3) Learn important bacterial and nematodal diseases of crops. 4) Apply principles of biological and chemical disease management.		
Course Outcomes: By the end of the course, students should be able to: 1) Explain fundamentals of plant pathology and identify pathogens and symptoms. 2) Identify fungal diseases and describe their management. 3) Recognize bacterial and nematodal diseases and suggest control measures. 4) Apply biological and chemical methods for disease management.		
Module	Title and Contents	Hrs.
Module 1	Module 1: Plant Pathology 1.1 Concept, history, importance of Plant Pathology; impact of plant diseases on human civilization. 1.2 Contributions of Indian and foreign plant pathologists (any three each); development of plant pathology in India. 1.3 Role of research institutes: Indian Agricultural Research Institute, International Crops Research Institute for the Semi-Arid Tropics, Forest Research Institute, Directorate of Weed Research, Sugarcane Research Institute Padegaon. 1.4 General characters of plant pathogens (algae, fungi, bacteria, viruses, PPLO, nematodes); major disease symptoms—smuts, rusts, powdery mildew, downy mildew, damping-off, mosaic, yellows, cankers, blights, wilts, anthracnose.	08
Module 2	Module 2: Fungal Diseases of Plant 2.1 Study of the following diseases with respect to symptoms, causal organism, disease cycle, and management: • Rust and head smut of jowar • Powdery mildew of teak • Anthracnose of bean • Tikka disease of groundnut	07

Module 3	Module 3: Bacterial and Nematodal diseases of plant 3.1 Study of the following diseases with respect to symptoms, causal organism, disease cycle, and management • Bacterial blight of rice • Bacterial wilt of tomato • Citrus canker • Root-knot disease of vegetables	08
Module 4	Module 4: Disease Management 4.1 Biological Control: Concept and principles of biological control; important examples in plant disease management. 4.2 Chemical Control: Introduction to pesticides- types, characteristics of ideal fungicide, and significance of chemical control. 4.3 Fungicides: Study of formulation, methods of application, mode of action, and uses of: • Sulphur fungicide – Thiram • Copper fungicide – Copper oxychloride • Mercury fungicide – Ceresan	07
Reference Books: - 1. Singh, R. S. <i>Plant Diseases</i>. New Delhi: Oxford & IBH Publishing Co., 1994. 2. Agrios, G. N. <i>Plant Pathology</i>. New Delhi: Academic Press (Indian Reprint), 2005. 3. Mehrotra, R. S., and A. Aggarwal. <i>Plant Pathology</i>. New Delhi: Tata McGraw-Hill Publishing Co., 2003. 4. Bilgrami, K. S., and H. C. Dube. <i>A Textbook of Modern Plant Pathology</i>. New Delhi: Vikas Publishing House, 1990. 5. Rangaswami, G., and A. Mahadevan. <i>Diseases of Crop Plants in India</i>. New Delhi: Prentice Hall of India, 1998.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3

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	Board of Studies in Botany	
	Programme: B. Sc.	Semester – V
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 355 Landscaping and Garden Design		

Course Objectives:

- 1) Understand principles and elements of landscape design
- 2) Identify and use ornamental plants in landscaping
- 3) Develop skills in planning, designing, and executing landscape projects
- 4) Gain practical knowledge of garden maintenance and management

Course Outcomes:

- 1) Design and plan different types of landscapes
- 2) Select suitable plants and materials for landscaping projects
- 3) Perform propagation and maintenance operations
- 4) Manage gardens efficiently using modern and sustainable techniques

Module	Title and Contents	Hrs.
Module 1	Module 1: Fundamentals of Gardening and Landscaping 1.1 Concept, scope, and importance of gardening and landscaping 1.2 Principles of landscape design: unity, balance, proportion, and rhythm 1.3 Terrarium and bonsai: types, preparation, and maintenance 1.4 Lawn establishment and maintenance: site preparation, grass selection, watering, mowing, and fertilization	08
Module 2	Module 2 Landscape Components and Materials 2.1 Softscape elements: trees, shrubs, climbers, lawns, groundcovers 2.2 Hardscape elements: paths, walls, fences, patios, water features 2.3 Selection of plants for different landscapes (avenues, parks, gardens) 2.4 Nursery practices for ornamental plants	07
Module 3	Module 3: Indoor and Outdoor Gardening 3.1 Concept, scope, and importance of indoor and outdoor gardening 3.2 Selection and propagation of plants for indoor and outdoor gardens 3.3 Design, layout, and maintenance of indoor and outdoor gardens 3.4 Common ornamental plants used in indoor and outdoor gardening and their care	07
Module 4	Module 4: Landscape Management and Maintenance	08

	4.1 Irrigation methods in landscaping 4.2 Pruning, training, mowing, fertilization 4.3 Pest and disease management in ornamental plants 4.4 Sustainable landscaping (xeriscaping, eco-friendly practices)	
Reference Books: - 1) Gardening in India: Authors: T.K. Bose & D. Mukherjee: 2018 (2nd Edition). 2) Ornamental Plants and Garden Design in Tropics and Subtropics: T.K. Bose, M.K. Sadhu, T.K. Maity & L.J. Singh 2020. 3) Introductory Ornamental Horticulture and Landscape Gardening Bijendra Kumar Singh & Rajaneesh Singh, 2024. 4) Tropical Horticulture (Vol. 1) S.K. Mitra, T.K. Bose & A.A. Farooqi 1999.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3	

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	Board of Studies in Botany	
	Programme: B. Sc.	Semester – V
	Type: DSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPP 356 Practicals based on Theory paper BPPT 351, BPPT 352, and BPPT 353		

Course Objectives: By the end of the course, students will be able to:

- 1) Describe and explain the principles of media preparation, sterilization techniques, staining methods, and basic plant pathology concepts.
- 2) Perform microbiological techniques such as isolation of soil fungi, inoculation methods (spread, streak, stab), and preparation of herbarium specimens.
- 3) Examine and differentiate plant diseases based on causal organisms, symptoms, and control measures, and to analyze cellular structures using microscopic techniques.
- 4) Evaluate taxonomic characters of plant families and construct systematic identification using local flora and morphological observations.

Course Outcomes: By the end of the course, students should be able to:

- 1) Prepare and sterilize culture media, perform staining techniques, and apply microbial inoculation methods accurately.
- 2) Isolate and identify soil fungi, analyze plant diseases with respect to symptoms, etiology, and control strategies.
- 3) Examine cell structures, perform micrometry, karyotype analysis, and evaluate anatomical and cytological features.
- 4) Classify plants based on morphological traits, prepare herbarium specimens, and identify genus and species using taxonomic keys and local flora.

Practical No.	Title and Contents	No. of hours per practical
1.	Study of morphological characters of plants. (Inflorescence, flower, Fruit)	04
2.	Study of simple and complex tissues (slides)	04
3.	Study of Anatomical structure of dicot and monocot root (T.S.)	04
4.	Study of Anatomical structure dicot and monocot stem (T.S.)	04
5.	Study of Anatomical structure dicot and monocot leaf (T.S.)	04
6.	Extraction and separation of phytoconstituents using basic laboratory techniques.	04
7.	Demonstration of plant-microbe interactions (e.g., root nodules, mycorrhiza).	04
8.	Analysis of soil parameters (pH, moisture, organic content).	04
9.	Application of biostatistical tools (chi-square test, correlation) using sample data.	04
10.	Demonstration of emasculation and artificial pollination technique.	04
11.	Study of plant-insect pests as per theory	04

	• Armyworm of jowar • Pod borer of green pea	
12.	• Fruit borer of bhendi • Cabbage caterpillar	04
13.	• Leaf miner of groundnut • Mealybugs of custard apple	04
14.	• Whiteflies of guava • Stored grain pests: Indian mealworm, saw-toothed beetle • Polyphagous pests: termites, aphids, Jassids	04
15..	Preparation of Biopesticides (Nicotine, Neem, Dashparni Ark)	04

Reference Books: -

1. Singh, R. S. *Principles of Plant Pathology*. New Delhi: MedTech Science Press, 2017.
2. Atwal, A. S., and T. N. Dhaliwal. *Agricultural Pests of South Asia and Their Management*. 5th ed. Ludhiana: Kalyani Publishers, 2019.
3. Srivastava, K. P. *A Textbook of Applied Entomology, Volume II: Economic and Applied Entomology*. New Delhi: Kalyani Publishers, 1993.
4. Pradhan, S. *Insect Pests of Crops*. New Delhi: National Book Trust, 1983.
5. Rajeev, K., and B. Vasantharaj David. *Elements of Economic Entomology*. Chennai: Popular Book Depot, 2016.
6. Sundarrao, P. S. S., and J. Richard. *Introduction to Biostatistics and Research Methods*. New Delhi: Prentice Hall of India, 2006.
7. Gupta, S. C., and V. K. Kapoor. *Fundamentals of Applied Statistics*. New Delhi: Sultan Chand & Sons, 2014.
8. Daniel, Wayne W., and Chad L. Cross. *Biostatistics: A Foundation for Analysis in the Health Sciences*. New Jersey: Wiley, 2013.
9. Esau, Katherine. *Anatomy of Seed Plants*. New York: Wiley, 1977.
10. Pandey, B. P. *Plant Anatomy*. New Delhi: S. Chand & Company, 2010.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – V
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPP 357 Practicals based BPPT 354 Plant Diseases and their management	

Course Objectives: By the end of the course, students will be able to:

- 1) Describe the symptoms, causes, and management of major plant diseases affecting crops.
- 2) Explain the classification and mode of action of different fungicides and antibiotics used in plant disease control.
- 3) Demonstrate the preparation methods of fungicidal mixtures such as Bordeaux and Burgundy mixtures.
- 4) Analyze laboratory techniques like paper chromatography for analysis of plant constituents.

Course Outcomes: By the end of the course, students should be able to:

- 1) Identify plant diseases based on symptoms and causal organisms.
- 2) Analyze the effectiveness of various fungicides and antibiotics in disease management.
- 3) Perform preparation of fungicidal formulations and laboratory techniques accurately.
- 4) Evaluate suitable disease control measures for different crops using scientific approaches.

Practical No.	Title and Contents	No. of hours per practical
1.	Study of plant diseases as per theory- Rust of Jowar	04
2.	Bacterial blight of rice	04
3.	Bacterial wilt of tomato	04
4.	Citrus canker	04
5.	Tikka disease of groundnut	04
6.	Head smut of jowar	04
7.	Anthraxnose of bean	04
8.	Powdery mildew of teak	04
9.	Study of Root-knot disease of vegetables	04
10.	Study of fungicides as per theory	04

	Sulphur fungicides – Thiram. Copper Fungicides – Copper Oxychloride	
11.	Mercury fungicides – Ceresan Heterocyclic Nitrogenous Compounds - Captan.	04
12.	Antibiotics – Streptomycin Systemic Fungicides – Bavistin and Vitavax	04
13.	Preparation of Bordeaux mixture and Bordeaux paste.	04
14.	Preparation of Burgundy mixture.	04
15.	Study of sugars by circular paper chromatography.	04

Reference Books: -

1. Agrios, George N. *Plant Pathology*. 5th ed. Burlington, MA: Elsevier Academic Press, 2005.
2. Chaube, H. S., and U. S. Pundhir. *Introductory Plant Pathology*. New Delhi: International Book Distributing Co., 2005.
3. Gupta, V. K. *Chemicals in Plant Disease Control*. New Delhi: CBS Publishers & Distributors, 2004.
4. Mehrotra, R. S. *Plant Disease Management*. New Delhi: Tata McGraw-Hill, 1980.
5. Pandey, B. P. *Textbook of Plant Pathology*. New Delhi: S. Chand Publishing, 1998.
6. Shrivastava, K. P. *A Manual of Practical Plant Pathology*. New Delhi: Kalyani Publishers, 1998.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – V
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPP 357 Practicals based BPPT 355 Landscaping and Garden Design	

Course Objectives: By the end of the course, students will be able to:

- 1) Develop hands-on skills in identification and use of ornamental plants.
- 2) Train students in preparation of garden layouts and landscape designs.
- 3) Provide practical knowledge of nursery techniques and plant propagation.
- 4) Build competencies in lawn establishment, planting, and garden maintenance.

Course Outcomes: By the end of the course, students should be able to:

- 1) Identify and classify ornamental plants such as trees, shrubs, climbers, and groundcovers.
- 2) Prepare and interpret garden layout plans and landscape designs.
- 3) Carry out cultural operations like pruning, training, watering, and fertilization.
- 4) Apply eco-friendly and sustainable practices such as composting and water-efficient irrigation.

Practical No.	Title and Contents	No. of hours per practical
1.	Study of different garden styles and preparation of report.	04
2.	Identification of ornamental plants (trees, shrubs, climbers).	04
3.	Study of Preparation of garden layout plan (drawing).	04
4.	Study of Lawn preparation and sowing methods.	04
5.	Study of preparation and maintenance of lawn.	04
6.	Study of Pruning and training of ornamental plants.	04
7.	Study of Preparation of nursery beds for ornamental plants.	04
8.	Study of Propagation methods (cutting, layering, grafting).	04
9.	Study of Design and layout of a small garden (model/field).	04
10.	Study of installation of garden components (paths, edging, fencing).	04
11.	Study of irrigation systems (drip, sprinkler).	04
12.	Study of propagation methods of indoor plants and outdoor plants.	04
13.	Study of Pest and disease identification in ornamental plants.	04
14.	Study of Preparation of compost/vermicompost for garden use.	04

15.	Preparation of landscape design / garden layout.	04
Reference Books: - 1. Jules, J. <i>Horticultural Science</i>. 3rd ed. San Francisco: W. H. Freeman and Co., 1979. 2. Khan, M. R. <i>Horticulture and Gardening</i>. Pune: Nirali Prakashan, 1995. 3. Kumar, N. <i>Introduction to Horticulture</i>. Nagercoil: Rajalakshmi Publications, 1997. 4. Lancaster, P. <i>Gardening in India</i>. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 1997. 5. Randhawa, G. S., and A. Mukhopadhyay. <i>Floriculture in India</i>. Mumbai: Allied Publishers, 1986.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation: (25 Marks) • Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks		End Semester Examination: (25 Marks) • Question -1 • Question -2 • Question -3 • Question - 4

	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 – V
	Type: VSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPPVS III: Advanced Botanical Skills III (Practical Based Course: Analytical Techniques and Microscopy)	

Course Objectives: By the end of the course, students will be able to:

- 1) Explain the principles and applications of chromatographic and spectroscopic techniques used for analyzing plant pigments, amino acids, and secondary metabolites.
- 2) Operate instruments such as TLC, HPLC, GC, and confocal microscopy for qualitative and quantitative analysis of plant-derived samples.
- 3) Distinguish between different plant cell types, tissues, and biomolecules using microscopy and histochemical techniques.
- 4) Assess the reliability and effectiveness of various separation and identification methods in plant biochemical and anatomical investigations.

Course Outcomes: By the end of the course, students should be able to:

- 1) Describe plant morphological characters such as inflorescence, flower, and fruit.
- 2) Identify and differentiate simple and complex tissues and study anatomical structures of dicot and monocot root, stem, and leaf using T.S. slides.
- 3) Perform extraction and separation of phytoconstituents and demonstrate plant–microbe interactions such as root nodules and mycorrhiza.
- 4) Analyze soil parameters such as pH, moisture, and organic content and interpret their importance in plant growth and development.

Practical No.	Title and Contents	No. of hours per practical
1.	Separation of plant pigments using Thin-Layer Chromatography (TLC).	04
2.	Separation of amino acids using Circular Paper Chromatography.	04
3.	Demonstration of High-Performance Thin Layer Chromatography (HPTLC).	04
4.	Demonstration of High-Performance Liquid Chromatography (HPLC).	04
5.	Demonstration of Column Chromatography.	04
6.	Demonstration of detection of metal ions in biological samples.	04

7.	Demonstration of Gas Chromatography (GC)	04
8.	Identification of functional groups in biomolecules using Fourier-Transform Infrared Spectroscopy (FTIR).	04
9.	Demonstration of identification of secondary metabolites in medicinal plants.	04
10.	Identification of plant cell types and tissues using bright field microscopy.	04
11.	Observation of unstained live cells using phase contrast microscope.	04
12.	Demonstration of imaging of subcellular structures in plant tissues using confocal microscopy.	04
13.	Demonstration of auto fluorescent compounds in plant cells.	04
14.	Demonstration of ultrastructural analysis of leaf epidermis and trichomes using scanning electron microscope (SEM).	04
15.	Measurement of cell size using an ocular and stage micrometer.	04
16.	Localization of starch, proteins, and lignin in plant tissues using histochemical staining.	04

Reference Books: -

1. Holme, D. J., and H. Peck. *Analytical Biochemistry*. New Jersey: Prentice Hall, 1998.
2. Miller, J. M. *Chromatography: Concepts and Contrasts*. New York: Wiley-Interscience, 2004.
3. Murphy, D. B. *Fundamentals of Light Microscopy and Electronic Imaging*. New York: Wiley-Blackwell, 2012.
4. Neelam, V. *Practical Manual of Histology for Medical Students*. New Delhi: Jaypee Brothers Medical Publishers, 2016.
5. Pavia, D. L., G. M. Lampman, and G. S. Kriz. *Introduction to Spectroscopy*. Noida: Cengage India Private Limited, 2015.
6. Wilson, K., and J. Walker. *Principles and Techniques of Biochemistry and Molecular Biology*. Cambridge: Cambridge University Press, 2010.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – V
	Type: CEP	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPPCEP-I: Community Engagement Programme in Plant Protection	
Course Objectives: By the end of the course, students will be able to: 1) Familiarize students with local ecological and botanical issues affecting rural or urban communities. 2) Promote application of botanical knowledge for sustainable community development. 3) Foster critical thinking and teamwork in addressing community-centric plant-related problems. 4) Develop communication skills for effective outreach and awareness in botanical sciences.		
Course Outcomes: By the end of the course, students should be able to: 1) Identify and describe key plant-based challenges (e.g., deforestation, invasive weeds, lack of herbal knowledge, crop failures) in local communities. 2) Apply botanical concepts (e.g., organic farming, medicinal plant cultivation, home gardening, biodiversity conservation) in real-life community settings. 3) Analyze community needs, collaborate with stakeholders, and develop viable green solutions (e.g., composting units, seed banks, tree plantations). 4) Design and deliver educational materials (e.g., pamphlets, talks, demonstrations) to raise awareness about plant conservation and sustainable practices among community members.		
Practical No.	Title and Contents	No. of hours per practical
1.	Field Project on Community Engagement Programme and Presentation	04

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	Yashwantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B. Sc.	Semester – V
	Type: OJT	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPPOJT-I: On-Job-Training in Plant Protection		

Course Objectives: By the end of the course, students will be able to:

- 1) Recognize and explain workplace structure, professional ethics, safety practices, and standard operating procedures relevant to the assigned organization.
- 2) Apply theoretical knowledge and technical skills in real work situations under supervision, following established protocols and guidelines.
- 3) Analyze work processes, identify problems, and interpret practical challenges encountered during on-job training.
- 4) Evaluate workplace practices and performance, and develop solutions, reports, or improvements based on experiential learning.

Course Outcomes: By the end of the course, students should be able to:

- 1) Demonstrate knowledge of workplace operations, safety norms, and professional conduct, and apply discipline-specific skills effectively.
- 2) Perform assigned tasks independently or collaboratively, using appropriate tools, techniques, and standard procedures.
- 3) Analyze practical problems, interpret data or observations, and suggest feasible solutions in a professional setting.
- 4) Evaluate their performance, prepare structured reports, and communicate findings effectively, demonstrating readiness for professional employment.

Practical No.	Title and Contents	No. of hours per practical
1.	On-Job-Training	120

	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 – VI
	Type: DSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 361 Plant Ecology		
Course Objectives: By the end of the course, students will 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: By the end of the course, students should be able to: 1) Discuss interactions between species and their environment that shape community 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: i) Edaphic factors: Soil- Origin and formation, Composition, soil profile. ii) Climatic factors: Light and Temperature as ecological factors. 1.3 Ecological Adaptations: Ecological adaptations in Hydrophytes, Xerophytes, Mesophyte, Halophyte, Epiphytes and parasites.	08
Module 2	Module 2: Plant Communities and Succession 2.1 Plant Communities: Introduction, general characters, forms and structure, Raunkier's life forms. 2.2 Plant Succession: characters, process and types – Hydrosere, Xerosere.	07
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. 3.3 Biogeochemical cycles - Phosphorus and Nitrogen cycle. 3.4 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. <i>A Textbook of Plant Ecology</i>. New Delhi: CBS Publishers and Distributors, 2017. 2. Agarwal, S. K. <i>Fundamentals of Ecology</i>. New Delhi: APH Publishing Corporation, 2008. 3. Krebs, C. J. <i>Ecology: The Experimental Analysis of Distribution and Abundance</i>. 3rd ed. New York: Harper and Row Publishers, 1985. 4. Kormondy, E. J. <i>Concepts of Ecology</i>. New Jersey: Prentice Hall Publishing Company, 1996. 5. Lieth, Helmut, and R. H. Whittaker. <i>Patterns of Primary Production in the Biosphere</i>. Berlin, Heidelberg, and New York: Springer Verlag, 1975. 6. Misra, K. C. <i>Manual of Plant Ecology</i>. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd., 1991. 7. Odum, E. P., and G. W. Barrett. <i>Fundamentals of Ecology</i>. California: Thomson Brooks/Cole Publishing, 2005. 8. Sharma, P. D. <i>Ecology and Environment</i>. Meerut: Rastogi Publications, 2007.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3	

	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 – VI
	Type: DSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 362 Fundamentals of Genetics		

Course Objectives: By the end of the course, students will be able to:

- 1) Understand basic principles of Mendelian genetics and inheritance patterns.
- 2) Explain the structure of chromosomes, nucleic acids, and gene organization.
- 3) Analyze chromosomal number and structural variations and their biological effects.
- 4) Apply concepts of linkage and non-Mendelian inheritance in explaining genetic variation.

Course Outcomes: By the end of the course, students should be able to:

- 1) Describe Mendel's laws and predict inheritance patterns using genetic crosses.
- 2) Interpret the structure and role of DNA, RNA, and chromosomes as genetic material.
- 3) Evaluate the impact of chromosomal variations on heredity and evolution.
- 4) Explain complex inheritance patterns including linkage and extranuclear inheritance.

Module	Title and Contents	Hrs.
Module 1	Module 1: Principles of Mendelian Genetics 1.1 Introduction, Scope and Importance of genetics 1.2 Mendel's laws of inheritance: Monohybrid and dihybrid crosses 1.3 Test cross and back cross 1.4 Extensions of Mendelism: Incomplete dominance and Codominance	08
Module 2	Module 2: Chromosomes and Genetic Material 2.1 Structure and types of chromosomes 2.2 DNA and RNA as genetic material 2.3 Experiments proving DNA as genetic material 2.4 Structure of gene	07
Module 3	Module 3: Numerical and Structural variation in chromosome 3.1 Introduction, definition and types: Polyploidy and Aneuploidy 3.2 Structural Changes in Chromosomes 3.3 Biological Significance of Chromosomal Variations	08
Module 4	Module 4: Linkage and Non-Mendelian Inheritance 4.1 Linkage and crossing over 4.2 Non- mendelian inheritance: Multiple alleles and Polygenic inheritance 4.3 Extrachromosomal inheritance	07

Reference Books: -

1. Gupta, P. K. Genetics. Meerut: Rastogi Publications, 2018.
2. Gupta, P. K. Cell Biology and Genetics. Meerut: Rastogi Publications, 2022.
3. Rastogi, Veer Bala. Genetics. Meerut: Kedar Nath Ram Nath Publishers, 2010.
4. Verma, P. S., and V. K. Agarwal. Genetics. New Delhi: S. Chand Publishing, 2016.
5. Singh, B. D. Fundamentals of Genetics. New Delhi: Kalyani Publishers, 2019.

Evaluation Pattern:**Total Marks: 50****Internal Continuous Evaluation (20Marks):**

- 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: (30 Marks)

- Question -1
- Question -2
- Question -3

	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 – VI
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPT 363: Laboratory Techniques in plant protection	
Course Objectives: By the end of the course, students will be able to: 1) Explain techniques used in soil microbiology and soil pathology. 2) Describe seed pathology, market pathology, and nursery diseases. 3) Demonstrate techniques in pathophysiology, culturing, and staining of plant pathogens. 4) Analyze recent techniques used in plant protection.		
Course Outcomes: By the end of the course, students should be able to: 1) Explain laboratory techniques in soil microbiology. 2) Describe laboratory techniques in soil pathology. 3) Explain laboratory techniques nursery diseases. 4) Describe laboratory techniques in pathophysiology of pathogens.		
Module	Title and Contents	Hrs.
Module 1	Module 1: Soil Microbiology & Pathology 1.1 Soil Microbiology: Introduction to soil microbiology, soil microorganism’s common examples and their role in maintaining soil health. 1.2 Methods of studying soil microorganisms: Culture method, Burried slide method and Respirometer. 1.3 Soil pathology: Introduction to soil pathology, soil sickness- Concept, causes and remedial measures Role of soil pathogens in plant pathology	08
Module 2	Module 2: Seed and Market Pathology 2.1 Seed Pathology: Concept, objectives and importance of seed pathology Examples of seed borne pathogens and methods to study them. Seed health management 2.2 Nursery diseases and their management (Any two From Fungal, bacterial) 2.3 Market pathology: -	07

	Concept, need and significance. Common examples of market pathogen and losses caused by them, Methods of management of market diseases	
Module 3	Module 3: Pathophysiology, Culture and Staining Techniques Pathophysiology 3.1 Concept and importance, causes for changes in physiology of diseased plant. 3.2 Paper Chromatographic technique in studying pathophysiology: pigments, amino acids, organic acids, sugars and polyphenols. 3.3 Culture techniques: Different culture media for isolating specific pathogens. 3.4 Staining techniques: Common stains used in plant pathology, their preparation & significance 3.5 Fungi: Cotton blue 3.6 Bacteria: Gram's stain Mycoplasma: Dien's stain	08
Module 4	Module 4: Techniques in Plant Protection 4.1 Recent techniques in Plant Protection a] GMO's (Genetically Modified Organisms) b] Pheromones c] Microbial pesticides d] Remote sensing e] Disease forecasting with computer 4.2 Eco friendly botanical pesticides	07
Reference Books: - 1. Agrios, G. N. <i>Plant Pathology</i> . 4th ed. San Diego: Academic Press, 1997. 2. Albajes, R., M. L. Gullino, J. C. van Lenteren, and Y. Elad. <i>Integrated Pest and Disease Management in Greenhouse Crops</i> . Dordrecht: Kluwer Academic Publishers, 2000. 3. Bold, H. C., G. J. Alexopoulos, and T. Delevoryas. <i>Morphology of Plants and Fungi</i> . 4th ed. New York: Harper and Row, 1980. 4. Chandrashekhara, S. N., and S. V. Parthasarathy. <i>Cytogenetics and Plant Breeding</i> . Madras: P. Varadachary and Co., 1965.		

5. Chatterjee, P. B. *Plant Protection Techniques*. Patna: Bharati Bhawan Publishers and Distributors, 1997.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20Marks):

- 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: (30 Marks)

- Question -1
- Question -2
- Question -3

	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 – VI
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 364: Field Techniques in plant protection		

Course Objectives: By the end of the course, students will be able to:

- 1) Impart the knowledge of Seed and Soil treatment and Instruments used.
- 2) Imbibe the knowledge of care and maintenance of Plant Protection equipments.
- 3) Learn the practical knowledge of about Plant clinic, Plant Protection Museum and IPM & IDM.
- 4) Impart the practical knowledge about plant breeding techniques to improve plant resistance

Course Outcomes: By the end of the course, students should be able to:

- 1) Discuss various Plant Protection techniques w.r.t. Seed and Soil treatment and Instruments used.
- 2) Demonstrate and explain care and maintenance of Plant Protection equipments.
- 3) Learns about Plant clinic, Plant Protection Museum and IPM & IDM.
- 4) Apply plant breeding techniques to improve plant resistance.

Module	Title and Contents	Hrs.
Module 1	Module 1: Plant Protection Techniques 1.1 Importance of plant protection, various equipment's used in Plant protection. 1.2 Seed treatment: Concept, objectives and importance, Traditional and modern methods, seed dressing equipments: simple seed dresser. 1.3 Soil treatment: Concept, objectives and importance, Traditional and modern methods soil treating equipments-soil injector, chemicals used in soil treatment 1.4 Soil solarization: Eco-friendly technique of soil treatment, Concept, objectives and importance, Description of soil solarization technique	08
Module 2	Module 2: Pesticide Application Equipments 2.1 Working and uses of following equipment. a. Pneumatic air pump – e.g. Hand pump and Diaphragm Pump	07

	b. Power operated – e.g. Mist blower c. Hydraulic energy pump – e.g. Peddle pump. 2.2 Types of nozzles – hydraulic energy, kinetic energy, gaseous energy and centrifugal energy. 2.3 Ultra-low volume sprayer 2.4 Drone technology in plant protection 2.5 Care and maintenance of plant protection equipment's and their importance	
Module 3	Module 3: Plant Clinic, Plant Protection Museum, IPM and IDM 3.1 Plant Clinic: Concept, objectives, requirements and importance of plant clinics. 3.2 Plant protection museum: Concept, collection and preservation of pathological and entomological specimens and their maintenance. Other exhibits to be displayed in museum like plant protection equipment's and various pesticides, 3.3 Role of museum in spreading awareness among farmers. 3.4 IPM: Concept need and introduction to Integrated Pest Management (IPM).	08
Module 4	Module 4: Breeding Technique for Disease Resistance 4.1 Plant Breeding: Definition, objectives and importance 4.2 Plant introduction and acclimatization: Concept, definition and objectives, merits, demerits and achievements 4.3 Selection: Concept, definition, types, merits and demerits. 4.4 Hybridization: Concept, definition, types, procedure and achievements. Back cross method: Concept, definition, procedure, merits and demerits Mutation breeding: Concept, definition and achievements. 4.5 Gamma garden: Role of Gamma Garden in crop improvement.	07

Reference Books: -

1. Aneja, K. R. *Experiments in Microbiology, Plant Pathology, and Biotechnology*. New Delhi: New Age International (P) Ltd. Publishers, 2005.
2. Atwal, A. S. *Agricultural Pests of India and South East Asia*. New Delhi: Kalyani Publishers, 1936.
3. Bold, H. C., G. J. Alexopoulos, and T. Delevoryas. *Morphology of Plants and Fungi*. 4th ed. New York: Harper and Row, 1980.
4. Chatterjee, P. B. *Plant Protection Techniques*. Patna: Bharati Bhawan Publishers and Distributors, 1997.

5. Chattopadhyay, S. P. *Principles and Procedures of Plant Protection*. New Delhi: Oxford and IBH, 1987.
6. Gunasekaran, P. *Laboratory Manual in Microbiology*. New Delhi: New Age International Pvt. Ltd., 1995.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20Marks):

- 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: (30 Marks)

- Question -1
- Question -2
- Question -3

	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 – VI
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPT 365: Economically Beneficial Insects		
Course Objectives: By the end of the course, students will be able to: 1) Know the basic knowledge about insects and their body parts. 2) Update the knowledge of importance of beneficial insects in Agriculture. 3) Understand the knowledge about commercial Apiculture. 4) Discuss about biocontrol agents and apply this knowledge for pest co		
Course Outcomes: By the end of the course, students should be able to: 1) Explain importance of beneficial insects. 2) Apply the commercial methods of bee rearing. 3) Understand concept biocontrol agents. 4) Update the knowledge concept parasitoids and predators		
Module	Title and Contents	Hrs.
Module 1	Module 1: Introduction to Beneficial Insects 1.1 Economic classification of insects: beneficial vs harmful 1.2 Types of beneficial insects: Pollinators, Predators, parasitoids & Productive insects 1.3 Role of beneficial insects in agriculture and ecosystem 1.4 Scope and importance in sustainable agriculture	08
Module 2	Module 2: Apiculture 2.1 Species of honey bees and their distribution, social organization: queen, worker, drone 2.2 Structure of beehive and communication 2.3 Apiary establishment and management 2.4 Bee products: honey, wax, pollen, propolis, royal jelly 2.5 Diseases, pests, and management of honey bees, Role of bees in crop pollination	07
Module 3	Module 3: Sericulture 3.1 History and importance of sericulture, Species of silkworm and host	08

	plants 3.2 Life cycle of silkworm 3.3 Mulberry cultivation and rearing practices and management 3.4 Diseases and pests of silkworm 3.5 Harvesting and processing of cocoons, silk production and uses	
Module 4	Module 4: Lac Culture 4.1 Introduction and importance of lac insects 4.2 Species and host plants (Kusum, ber, palas) 4.3 Life cycle and biology of lac insect 4.4 Methods of lac cultivation, harvesting and processing of lac 4.5 Lac products and uses 4.6 Enemies and management	07
Reference Books: - 1. Dhaliwal, G. S. <i>Elements of Agricultural Entomology</i>. New Delhi: Kalyani Publishers, 2015. ISBN: 978-93-272-5134-0. 2. Ross, Conrad. <i>Natural Beekeeping: Organic Approaches to Modern Apiculture</i>. White River Junction: Chelsea Green Publishing, 2013. 3. Butt, Tariq M., Chris Jackson, and Naresh Magan. <i>Fungi as Biocontrol Agents: Progress, Problems and Potential</i>. Wallingford: CABI Publishing, 2001. 4. Srivastava, K. P., and G. S. Dhaliwal. <i>A Textbook of Applied Entomology</i>. Vol. 2. New Delhi: Kalyani Publishers. 5. David, B. V., and V. V. Ramamurthy. <i>Elements of Economic Entomology</i>. 7th ed. New Delhi: Namrutha Publications. 6. Ragumoorthy, K. N., M. R. Srinivasan, V. Balasubramani, and N. Natarajan. <i>Principles of Applied Entomology</i>. Coimbatore: Publication. 7. Tembhare, D. B. <i>Modern Entomology</i>. Mumbai: Himalaya Publishing House. ISBN: 978-93-5051-828-1. 8. Dhaliwal, G. S., Ram Singh, and B. S. Chillar. <i>Essentials of Agricultural Entomology</i>. New Delhi: Kalyani Publishers.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20Marks): • 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: (30 Marks) • Question -1 • Question -2 • Question -3

	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 – VI
	Type: DSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPP 366 Practicals based on Theory paper BPPT 361, BPPT 362, and BPPT 363		
Course Objectives: By the end of the course, students will be able to: 1) Understand the fundamental principles of classical and molecular genetics, including linkage, crossing over, polygenic inheritance, and chromosomal behavior during meiosis. 2) Develop skills in cytogenetic techniques such as chromosome counting, detection of meiotic abnormalities, and karyotype/idiogram preparation. 3) Perform and analyze molecular biology techniques, including DNA isolation, quantification, electrophoresis, and PCR. 4) Demonstrate practical knowledge of plant biotechnology techniques such as tissue culture, genetic transformation, and preparation of culture media.		
Course Outcomes: By the end of the course, students should be able to: 1) Explain and interpret genetic phenomena such as linkage, recombination, and polygenic inheritance using experimental data. 2) Perform cytological techniques for chromosome analysis and identify meiotic abnormalities in plant systems. 3) Isolate, quantify, and evaluate DNA quality using standard molecular techniques like CTAB method, spectrophotometry, and gel electrophoresis. 4) Demonstrate and design basic plant biotechnology experiments including tissue culture, PCR, and genetic engineering approaches such as Golden Rice development.		
Practical No.	Title and Contents	No. of hours per practical
1.	Study of morphological and anatomical adaptations in Hydrophytes - <i>Hydrilla</i> , <i>Eichhornia</i> .	04
2.	Study of morphological and anatomical adaptations in Xerophytes - <i>Aloe</i> , <i>Nerium</i> .	04
3.	Study of morphological and anatomical adaptations in Epiphytes (Orchid) and Parasites, (<i>Cuscuta</i>).	04
4.	Study of Ecological pyramids based on the field data / given data.	04
5.	Study of phytogeographical regions of India using standard maps	04
6.	Study of genetic examples on linkage.	04
7.	Study of genetic examples on crossing over.	04
8.	Study of genetic examples on polygene inheritance.	04

9.	Detection of meiotic anomalies in chromosome in <i>Rhoeo</i> .	04
10.	Study of karyotype by using photograph.	04
11.	Study of preparation of culture media used in plant protection. (PDA)	04
12.	Detection of pigments of healthy and infected plant material by paper chromatography method.	04
13.	Estimation of sugar composition of healthy and diseases leaves of crop plants (2-3 different diseases)	04
14.	Estimation of polyphenols composition of healthy and diseases leaves of crop plants (2-3 different diseases)	04
15.	Pathophysiological study w.r.t. moisture content and RWC in leaves of crop plants.	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.
5. Pandey, B. P. *Modern Practical Botany*. Vols. I and II. New Delhi: S. Chand and Company Ltd., 1999.
6. Singh, G. *Angiosperm Systematics: Theory and Practice*. New Delhi: S. Chand and Company Ltd., 2000.
7. Wallis, C. J. *Practical Botany for Advanced Level and Intermediate Students*. 5th ed. London: William Heinemann Medical Books Ltd., 1966.
8. Karp, G., J. Iwasa, and W. Marshall. *Cell and Molecular Biology: Concepts and Experiments*. New York: John Wiley & Sons Inc., 2020.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – VI
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPP 367 Practicals based on Theory paper BPPT 364 Field Techniques in Plant Protection	

Course Objectives: By the end of the course, students will be able to:

- 1) Develop practical skills in identifying soil and seed-borne fungal pathogens using specimens and slides.
- 2) Analyze the physiological impact of plant diseases through pigment, sugar, and polyphenol estimations.
- 3) Familiarize students with nursery and market diseases of vegetables and fruits caused by fungi.
- 4) Introduce students to microbial pesticides and their application, including hands-on preparation and use.

Course Outcomes: By the end of the course, students should be able to:

- 1) Identify common soil, seed, and market fungal pathogens in crops.
- 2) Demonstrate proficiency in physiological estimations (moisture, RWC, pigments, sugars, polyphenols) in diseased plants.
- 3) Understand the role and types of microbial pesticides and their practical applications.
- 4) Gain awareness of GMOs and their relevance in plant pathology and disease resistance.

Practical No.	Title and Contents	No. of hours per practical
1.	Study of isolation of soil microbes by serial dilution method.	04
2.	Study of fungal soil borne pathogen of crop plants. (e.g. Wilt, Damping off)	04
3.	Study of fungal seed borne pathogen of crop plants. (e.g. Smut, Rust)	04
4.	Study and application of Seed treatment methods for seed borne pathogens (Fungicides and Biofertilizers).	04
5.	Study and application of Soil treatment Methods for Control of Soil-borne pathogens.	04
6.	Study of Soil solarization technique for soil disinfection.	04
7.	Study of different pesticide application equipment and Their Uses.	04
8.	Study of fungal seed borne pathogens of crop plants.	04

9.	Study of moisture content and relative water content (RWC) of soil	04
10.	Study of preservation technique used in plant protection.	04
11.	Study of plant originated pesticide.	04
12.	To study diagnosis, maintaining record book and advisory services provided to farmers for plant health problems.	04
13.	Study of Screening techniques used for disease (on field) identification	04
14.	Study of emasculation techniques in self-pollinated crops.	04
15.	Study of field visit	04

Reference Books: -

1. Mehrotra, R. S., and Ashok Aggarwal. *Plant Pathology*. New Delhi: Tata McGraw-Hill, 2003.
2. Rangaswami, G., and D. J. Bagyaraj. *Agricultural Microbiology*. New Delhi: PHI Learning, 2004.
3. Mukherjee, K. G. *Fungi and Plant Disease*. New Delhi: Oxford & IBH Publishing, 1980.
4. Dubey, R. C. *A Textbook of Biotechnology*. New Delhi: S. Chand & Company Ltd., 2014.
5. Gupta, V. K., and A. K. Sharma. *Microbial Pesticides: Principles and Applications*. New Delhi: New India Publishing Agency, 2007.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – VI
	Type: DSE	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPP 367 Practicals based on Theory paper BPPT 365 Economically Beneficial Insects	

Course Objectives: By the end of the course, students will be able to:

- 1) Identify different beneficial insects and understand their roles in agriculture.
- 2) Develop skills in apiculture, sericulture, and lac culture practices.
- 3) Understand the biology, life cycle, and management of honey bees, silkworms, and lac insects.
- 4) Gain hands-on experience in handling equipment and processing insect products.

Course Outcomes: By the end of the course, students should be able to:

- 1) Perform basic beekeeping operations like hive handling and honey extraction.
- 2) Diagnose common bee diseases and pests and suggest management measures.
- 3) Explain silkworm life cycle and rearing techniques.
- 4) Carry out cocoon harvesting and silk extraction processes.

Practical No.	Title and Contents	No. of hours per practical
1.	Identification of beneficial insects (pollinators, predators, parasitoids)	04
2.	Study of honey bee species and castes	04
3.	Observation of beehive structure and components	04
4.	Study of apiary site selection and layout	04
5.	Study of handling of bee equipment	04
6.	Honey extraction and processing.	04
7.	Identification of bee diseases and pests.	04
8.	Study of silkworm life stages	04
9.	Study of Mulberry cultivation practices	04
10.	Study of Rearing of silkworm (feeding, cleaning, mounting)	04
11.	Study of Cocoon harvesting and grading.	04
12.	Study of silk extraction process	04
13.	Identification of lac host plants	04

14.	Study of lac insect life cycle and infestation	04
15.	Study of harvesting and processing of lac	04

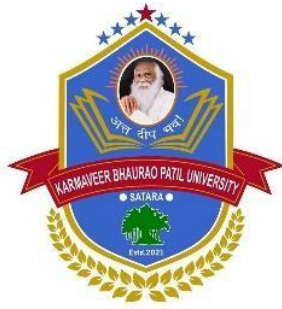
Reference Books: -

1. Dhaliwal, G. S. *Elements of Agricultural Entomology*. New Delhi: Kalyani Publishers, 2015. ISBN: 978-93-272-5134-0.
2. Ross, Conrad. *Natural Beekeeping: Organic Approaches to Modern Apiculture*. White River Junction: Chelsea Green Publishing, 2013.
3. Butt, Tariq M., Chris Jackson, and Naresh Magan. *Fungi as Biocontrol Agents: Progress, Problems and Potential*. Wallingford: CABI Publishing, 2001.
4. Srivastava, K. P., and G. S. Dhaliwal. *A Textbook of Applied Entomology*. Vol. 2. New Delhi: Kalyani Publishers.
5. David, B. V., and V. V. Ramamurthy. *Elements of Economic Entomology*. 7th ed. New Delhi: Namrutha Publications.
6. Ragumoorthy, K. N., M. R. Srinivasan, V. Balasubramani, and N. Natarajan. *Principles of Applied Entomology*. Coimbatore: Publication.
7. Tembhare, D. B. *Modern Entomology*. Mumbai: Himalaya Publishing House. ISBN: 978-93-5051-828-1.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – VI
	Type: VSC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPPVSC IV: Advanced Botanical Skills IV (Practical Based Course: Molecular Biology Techniques)	
Course Objectives: By the end of the course, students will be able to: 1) Explain the principles behind molecular techniques such as DNA isolation, gel electrophoresis, PCR, and protein estimation methods. 2) Perform nucleic acid and protein isolation, quantification, and analysis using standard molecular biology protocols. 3) Evaluate the quality and purity of nucleic acids and proteins using spectrophotometry, gel electrophoresis, and chromatographic techniques. 4) Design experimental workflows involving gene expression analysis, protein profiling, and molecular docking for plant research.		
Course Outcomes: By the end of the course, students should be able to: 1) Recall and explain key concepts of molecular techniques such as PCR, DNA fingerprinting, PAGE, and protein purification. 2) Isolate genomic/plasmid DNA and proteins, quantify them, and analyze purity and integrity using electrophoretic and spectrophotometric methods. 3) Analyze DNA/protein data, evaluate experimental results such as A260/A280 ratios or gel profiles, and interpret gene expression patterns from RT-qPCR. 4) Construct a mini-project or protocol involving DNA/protein analysis and in silico protein docking to investigate a plant molecular biology question.		
Practical No.	Title and Contents	No. of hours per practical
1.	Isolation of plant genomic DNA.	04
2.	Isolation of plasmid DNA.	04
3.	Estimation of plant genomic DNA.	04
4.	Determination of nucleic acid purity (A260/A280 ratio).	04
5.	Agarose gel electrophoresis.	04
6.	Demonstration of Polymerase Chain Reaction (PCR) using thermal cycler.	04
7.	Demonstration of DNA fingerprinting.	04
8.	Demonstration of restriction digestion and ligation.	04
9.	Demonstration of gene expression using real time PCR (RT qPCR).	04

10.	Estimation of protein concentration using Lowry method.	04
11.	Estimation of protein concentration using the Bradford method.	04
12.	Demonstration of protein purification using column chromatography.	04
13.	Protein separation and analysis using Polyacrylamide Gel Electrophoresis (PAGE).	04
14.	Protein profiling in plant samples using SDS-PAGE.	04
15.	Demonstration of 2D protein profiling	04
16.	Demonstration of protein docking.	04

Reference Books: -

1. Carson, S., H. Miller, M. C. Srougi, and D. S. Witherow. *Molecular Biology Techniques: A Classroom Laboratory Manual*. Cambridge: Academic Press Inc., 2019.
2. Hames, B. D., and D. Rickwood. *Gel Electrophoresis of Proteins: A Practical Approach*. Oxford: Oxford University Press, 1981.
3. Innis, M. A., D. H. Gelfand, and J. J. Sninsky. *PCR Protocols: A Guide to Methods and Applications*. Cambridge: Academic Press Inc., 1990.
4. Sambrook, J., and D. W. Russell. *Molecular Cloning: A Laboratory Manual*. U.S.A.: Cold Spring Harbor Laboratory Press, 2000.
5. Scopes, R. K. *Protein Purification: Principles and Practice*. New York: Springer-Verlag Inc., 1993.
6. Wilson, K., and J. Walker. *Principles and Techniques of Biochemistry and Molecular Biology*. Cambridge: Cambridge University Press, 2010.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: (25 Marks)	End Semester Examination: (25 Marks)
• Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks	• Question -1 • Question -2 • Question -3 • Question - 4

	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 – VI
	Type: SEC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
	Name of the Course: BPPPSEC III: Artificial Intelligence in Plant Protection	

Course Objectives: By the end of the course, students will be able to:

- 1) Understand the principles and applications of artificial intelligence tools in plant identification and biodiversity studies.
- 2) Develop practical skills in field survey, plant documentation, and the use of AI-enabled mobile applications for species identification.
- 3) Apply quantitative methods for analyzing plant diversity using indices such as alpha, beta, and gamma diversity.
- 4) Enhance analytical and digital competencies through database creation, QR code generation, and evaluation of conservation status of plant species.

Course Outcomes: By the end of the course, students should be able to:

- 1) Use and evaluate AI-based tools for accurate plant identification and biodiversity assessment.
- 2) Conduct field surveys and analyze plant diversity using appropriate ecological indices.
- 3) Develop and manage digital plant databases and generate QR codes for scientific documentation and dissemination.
- 4) Assess and interpret the conservation status of plant species and propose suitable conservation strategies.

Practical No.	Title and Contents	No. of hours per practical
1.	Study of AI-based mobile applications for plant identification (Compare 2–3 apps; evaluate accuracy, features, limitations)	04
2.	Field survey of plant diversity in three local areas (Systematic sampling, GPS tagging, photographic documentation)	04
3.	Quantitative analysis of biodiversity (Calculation of alpha, beta, and gamma diversity indices)	04
4.	Validation of AI-based identification (Compare AI results with standard floras/taxonomic keys important academic addition)	04
5.	Development of digital plant database (Include scientific name, family, habit, location, uses, images)	04
6.	Generation and application of QR codes (Link QR codes to plant database; field labelling concept)	04
7-10.	Project Work: AI-based plant diversity assessment project ➤ Survey, identification using AI tools ➤ Data validation and error analysis ➤ Preparation of a structured report (with maps, tables, graphs)	16

11-13.	Conservation Status Assessment ➤ Assessment using IUCN categories ➤ Identification of rare, endangered, or invasive species ➤ Documentation of threats and conservation needs	12
14.	Case study on local conservation strategies (Protected areas, sacred groves, agroforestry systems, etc.)	04
15.	Data visualization and presentation (Graphs, charts, diversity indices, and digital reporting using Excel or similar tools)	04
Reference Books: - 1. Bonnet, P., A. Joly, and C. Davis. <i>Plant Biodiversity Science in the Era of Artificial Intelligence</i>. Lausanne: Frontiers Media SA, 2022. 2. Qiao, Y., J. Valente, Z. Zhang, D. Su, and D. He. <i>AI, Sensors and Robotics in Plant Phenotyping and Precision Agriculture</i>. Lausanne: Frontiers Media SA, 2022. 3. Zhou, Y., Q. Xia, Z. Zhang, M. Quan, and H. Li. "Artificial Intelligence and Machine Learning for the Green Development of Agriculture in the Emerging Manufacturing Industry in the IoT Platform." <i>Acta Agriculturae Scandinavica, Section B – Soil & Plant Science</i> 72 (2022): 284–299.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation: (25 Marks) • Student Attendance- 5 marks • Student performance- 5 marks • Journal- 5 marks • Viva voce- 10 marks		End Semester Examination: (25 Marks) • Question -1 • Question -2 • Question -3 • Question - 4

	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 – VI
	Type: CC	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPTCC I National Service Scheme		

Course Objectives: By the end of the course, students will be able to:

- Describe the basic concepts of NSS, including its motto, symbol, aims, objectives, and organizational structure.
- Explain and apply the principles of NSS programs and activities in community engagement, including village adoption and special camping programs.
- Analyze the factors affecting national integration and evaluate the role of NSS in overcoming social, cultural, and regional barriers.
- Develop and organize special programs related to legal awareness, health, first aid, leadership, and community development.

Course Outcomes: By the end of the course, students should be able to:

- Identify and explain the fundamental concepts, structure, and functions of NSS.
- Participate effectively in NSS regular activities and implement community-based programs such as special camps and outreach initiatives.
- Examine issues related to national integration and assess the impact of social barriers and NSS interventions.
- Design and execute awareness programs (legal, health, first aid, leadership) and demonstrate leadership and teamwork skills in community service.

Module	Title and Contents	Hrs.
Module 1	Module 1: Introduction to Basic concept of NSS 1.1. Basic of NSS, the motto, Symbol, Badge, Symbol, NSS song, 1.2. Aims and objective of NSS. 1.3. Classification of NSS program 1.4. Organizational structure, roles, and responsibilities of various, 1.5. NSS functionaries.	08
Module 2	Module 2: NSS Program and activities 2.1. NSS Regular activities in adopted villages, Slums and with Voluntary Organizations 2.2. Contributions of Special Camping Program, Planning and preparation	07

	of special camping program 2.3. Guidelines for the success of Camp 2.4. Importance of a successful camping program 2.5. Organization, administration. 2.6. Involvement in community.	
Module 3	Module 3: National Integration 3.1. Introduction 3.2. Need for National integration 3.3. Various obstacles in the way of National Integration: caste, religion, language, and provisional problems etc.	08
Module 4	Module 4: Special Program 4.1. Legal awareness 4.2. Health awareness 4.3. First-aid 4.4. Career guidance 4.5. Leadership training - cum - Cultural Program 4.6. Globalization and its Economic Social Political and Cultural impacts	07
Reference Books: - 1. Ahuja, R. <i>Social Problems in India</i> . South Asia Books, 2014. 2. Dubal, R. S., and M. N. Gaikwad. <i>Handbook of NCC</i> . Pune: Tanvi Prakashan, 2020. 3. <i>NSS Handbook & Action Plan</i> . Chennai: Bharath University, 2017–18.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation: (20 Marks) • CCE I • CCE II • CCE III		End Semester Examination: (30 Marks) • Question -1 • Question -2 • Question -3

	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 – VI
	Type: FP	Marks: 50
	Credits: 2	From: A. Y. 2026-27
Name of the Course: BPPFP-I: Field Project in Plant Protection		
Course Objectives: By the end of the course, students will be able to: 1) Identify and classify local flora using standard taxonomic principles. 2) Design and conduct field-based research related to plant ecology, diversity, or conservation. 3) Analyze and interpret ecological and botanical data gathered during fieldwork. 4) Communicate scientific findings effectively through written reports and presentations.		
Course Outcomes: By the end of the course, students should be able to: 1) Recognize and differentiate plant species in their natural habitat and classify them up to family level using dichotomous keys and floras. 2) Formulate research questions, design a field study, and implement data collection protocols to investigate ecological or botanical phenomena. 3) Analyze field data using basic statistical methods and interpret patterns and relationships within the context of ecological principles. 4) Prepare a structured project report, present findings clearly, and defend their conclusions with scientific reasoning and visual aids.		
Practical No.	Title and Contents	No. of hours per practical
1.	Field Project Proposal Writing and Presentation	04