



Karmaveer Bhaurao Patil University, Satara

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

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

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

PREAMBLE:

The B.Sc. Plant Protection course under the autonomy framework will be introduced in the academic year 2024-2025. 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.

PROGRAM SPECIFIC OBJECTIVES:

1. The students are expected to understand the fundamentals, principles, concepts and recent developments in the Plant Protection.
2. The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in Plant Protection.
3. It is expected to inspire and boost interest of the students in Plant Protection.
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. (Plant Protection) Programme the students will.....

1. Explain, discuss and answer questions related to the various aspects of plant protection and major agronomical crops.
2. Gain in-depth knowledge of plant diseases, pests, and weeds, including their biology, ecology, and control methods.
3. Utilize biological, chemical, cultural, and physical control methods in a balanced approach to manage pests and diseases.
4. Explain the basics of plant pathology and weed science.
5. Acquire knowledge about the different classes of pesticides, their modes of action, application techniques, and safety protocols.
6. Become skilled to enter into industries and research institutes related to plant protection.
7. Be able to set up their own business and consultancies related to protection of Plant.

1. TITLE: **Plant Protection**

2. YEAR OF IMPLEMENTATION: **2024-2025**

3. DURATION: **01 year**

4. PATTERN: **Semester examination**

5. MEDIUM OF INSTRUCTION: **English**

6. ELIGIBILITY OF THE STUDENT:

Higher Secondary Certificate (HSC/10+2) examination or an equivalent examination from a recognized Board with the Science stream, including Biology as one of the subjects.

7. ELIGIBILITY OF THE CORE FACULTY:

As per the rule and regulation of the UGC and Government of Maharashtra.

8.STRUCTURE OF COURSE:

Level	Semester	Course	DSC	OE	AEC/VEC/IKS	Total	Degree/Cum. Cr. MEME
4.5	I	I	DSC-I (2) DSC-II (2) DSC P-I (2)	2	IKS I (2) (Generic)	22	UG Certificate 44
		II	DSC-I (2) DSC-II (2) DSC P-I (2)				
		III	DSC-I (2) DSC-II (2) DSCP-I (2)				
4.5	II	I	DSC-I (2) DSC-II (2) DSC P-I (2)	2	VEC I (2) DEGG and IIC	22	
		II	DSC-I (2) DSC-II (2) DSC P-I (2)				
		III	DSC-I (2) DSC-II (2) DSC P-I (2)				

9.COURSE TITLE:**1) FIRST SEMESTER**

Sr. No.	Subject Title	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits		No. of Practical Per week	Credits
1	Plant Protection	Course – I BPPT 111	Fundamentals of Plant Pathology	4	4	Practical Course– I BPPP 113	2	2
		Course –II BPPT 112	Fundamentals of Soil Science					
2	OE	BPPTOE 1	-	2	2			
3	IKS	BPPTIKS 1	-	2	2			

2)SECOND SEMESTER

Sr. No.	Subject Title	Theory				Practical		
		Course No. & Course Code	Title of Paper	No. of lectures per week	Credits		No. of Practical Per week	Credits
1	Plant Protection	Course – III BPPT 121	Biofertilizer Production Technology	4	4	Practical Course– II BPPP 123	2	2
		Course – IV BPPT 122	Principles of Organic Farming					
2	OE	BPPTOE-II	-	2	2			
3	VEC	BPPTVEC I	DEGG and IIC	2	2			

10. EVALUATION STRUCTURE:

Theory

Assessment Category	Internal Evaluation (Best of two CCE Marks will be considered)				ESE	Total Marks	Credits
	CCE-I	CCE-II	CCE-III	Total			
Theory of 2 Credits	10	10	10	20	30	50	02

Practical

Assessment Category	Internal Evaluation	ESE	Total Marks	Credits
	Journal / Viva/Activity			
Practical of 2 Credits	20	30	50	02

OTHER FEATURES:

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)

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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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B. Sc.	Semester – I
	Type: DSC I	Marks: 50
	Credits: 2	From: A. Y. 2024-25
Name of the Course: BPPT 111: Fundamentals of Plant Pathology		
Course Objectives: By the end of the course, students will be able to: 1) Understand the basic concepts and terminology of plant diseases. 2) Analyze the role of environmental factors in disease development. 3) Apply principles and methods of plant disease management. 4) Evaluate Integrated Disease Management (IDM) strategies for sustainable crop protection.		
Course Outcomes: By the end of the course, students should be able to: 1) Describe the concepts and symptoms of plant diseases. 2) Analyze disease epidemiology and environmental influences. 3) Apply suitable plant disease management practices. 4) Evaluate IDM approaches for effective and sustainable disease control.		
Module	Title and Contents	Hrs.
Module 1	Module 1: Concept of Plant Diseases 1.1 Introduction and importance of plant diseases. 1.2 Concept of plant diseases 1.3 Terminologies in plant protection, Disease triangle concept 1.4 Symptoms and signs of plant diseases. 1.5 Dissemination of plant pathogens. 1.6 Survival of plant pathogen. 1.7 Flowering parasitic plants.	08
Module 2	Module 2: Epidemiology and Environmental factors 2.1 Plant disease epidemiology: Simple interest diseases, Compound interest diseases, slow and rapid epiphytotic. 2.2 Effect of temperature, moisture, rainfall, relative humidity, soil moisture, wind, light, soil pH, Soil type, host-plant nutrition, pollutants.	07
Module 3	Module 3: Principles of Plant Disease Management 3.1 Introduction to plant disease management 3.2 Principles of Plant Disease Management 3.3 Methods of Plant Disease Management i) Avoidance ii) Exclusion iii) Eradication	08

	iv) Protection v) Immunization vi) Therapy	
Module 4	Module 4: Integrated Disease Management 4.1 Introduction, scopes and concept of integrated disease management 4.2 Components of integrated disease management (IDM) 4.3 Resistance: Host resistance and Induced systemic resistance 4.4 Genetically improved plants 4.5 Physical, chemical and biological methods of IDM 4.6 Plant nutrition 4.7 Use of pesticides of plant origin 4.8 Judicious use of chemicals	07
Reference Books: 1. Agrios, George N. <i>Plant Pathology</i> . 5th ed. San Diego: Academic Press, 2005. 2. Aneja, K. R. <i>Experiments in Microbiology, Plant Pathology and Tissue Culture</i> . New Delhi: New Age International (P) Ltd., 2005. 3. Baruah, H. K. <i>Text Book of Plant Pathology</i> . New Delhi: Oxford and IBH Publishing Co., 1984. 4. Bilgrami, K. S. <i>Textbook of Modern Plant Pathology</i> . New ed. New Delhi: Vikas Publishing House, 1990. 5. Butler, E. J., and S. G. Jones. <i>Plant Pathology</i> . London: Macmillan & Co., 1949. 6. Chattopadhyay, S. B. <i>Principles and Procedures of Plant Protection</i> . New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 1987. 7. Jain, Vijay. <i>Laboratory Manual of Plant Pathology</i> . Calcutta: Oxford Book Company, 2009. 8. Mehrotra, R. S., and Ashok Aggarwal. <i>Fundamentals of Plant Pathology</i> . New Delhi: McGraw-Hill Education Pvt. Ltd., 1980.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I: 10 Marks: Home Assignment • CCE - II: 10 Marks: Short and long answer questions Test/Seminar/Open Book Test/Quiz/Case study/Book review/Field work/ Industry visit • CCE- III: 10 marks: Compulsory MCQ test • (Note: 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 – I
	Type: DSC II	Marks: 50
	Credits: 2	From: A. Y. 2024-25
Name of the Course: BPPT 112: Fundamentals of Soil Science		
Course Objectives: By the end of the course, students will be able to: 1) Understand the composition of the earth's crust and soil formation. 2) Explain soil classification, horizons, and soil properties. 3) Analyze soil characteristics and water relations. 4) Evaluate the role of soil organic matter, pH, and nutrients in soil fertility.		
Course Outcomes: By the end of the course, students should be able to: 1) Describe soil formation, composition, and classification. 2) Explain soil horizons and physico-chemical properties. 3) Analyze soil characteristics and water relations. 4) Evaluate soil fertility based on organic matter, pH, and nutrient availability.		
Module	Title and Contents	Hrs.
Module 1	Module 1: Composition of Earth crust 1.1 Structure and Composition of earth crust 1.2 Rocks 1.3 Land 1.4 Soil: Major components of soil, Fundamental soil forming processes.	08
Module 2	Module 2: Study of soils 2.1 Soil: Introduction, Definition, Importance of soil 2.2 Classification of soil 2.3 Horizons of soil 2.4 Physico-chemical properties of soil with its importance	07
Module 3	Module 3: Soil Characteristics and Water Relations 3.1 Soil Colour and its Significance 3.2 Soil Porosity and Aeration 3.3 Soil Water Movement 3.4 Water-Holding Capacity of Soil	08
Module 4	Module 4: Soil Fertility and Nutrient Dynamics 4.1 Introduction, Importance of organic matter 4.2 Sources of Soil organic matter	07

	4.3 Introduction, Importance of soil pH, Factors affecting soil pH 4.4 Soil Nutrient, their availability and importance	
Reference Books: 1. Brady, Nyle C., and Ray R. Weil. <i>The Nature and Properties of Soils</i>. 15th ed. New Delhi: Pearson Education, 2017. 2. Das, D. K. <i>Introductory Soil Science</i>. 4th ed. New Delhi: Kalyani Publishers, 2013. 3. Biswas, T. D., and S. K. Mukherjee. <i>Textbook of Soil Science</i>. 2nd ed. New Delhi: Tata McGraw-Hill Education, 2006. 4. Foth, Henry D. <i>Fundamentals of Soil Science</i>. 8th ed. New York: John Wiley & Sons, 1990. 5. Sehgal, J. L. <i>Pedology: Concepts and Applications</i>. 2nd ed. New Delhi: Kalyani Publishers, 2005. 6. Tisdale, Samuel L., Werner L. Nelson, James D. Beaton, and John L. Havlin. <i>Soil Fertility and Fertilizers: An Introduction to Nutrient Management</i>. 8th ed. Upper Saddle River, NJ: Pearson Education, 2013. 7. Yawalkar, K. S., A. G. Agarwal, and S. Bokde. <i>Manures and Fertilizers</i>. 10th ed. Nagpur: Agri-Horticultural Publishing House, 2000.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (10Marks): • CCE - I: 10 Marks: Home Assignment • CCE - II: 10 Marks: Short and long answer questions Test/Seminar/Open Book Test/Quiz/Case study/Book review/Field work/ Industry visit • CCE- III: 10 marks: Compulsory MCQ test • (Note: 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 – I
	Type: DSC P	Marks: 50
	Credits: 2	From: A. Y. 2024-25
	Name of the Course: Practical Course-BPPP 113: (Based on theory paper BPPT 111 and BPPT 112)	
Course Objectives: By the end of the course, students will be able to: 1) Explain the fundamental concepts of plant protection and soil science. 2) Demonstrate basic laboratory techniques used in plant protection and soil analysis. 3) Examine the principles of plant disease management and integrated disease management. 4) Apply sustainable practices for plant protection and soil management.		
Course Outcomes: By the end of the course, students should be able to: 1) Identify common plant diseases, their symptoms, signs, and causal agents. 2) Perform laboratory techniques for plant protection and soil analysis. 3) Analyze soil properties and their significance in plant growth. 4) Apply integrated disease management strategies for sustainable crop production.		
Practical No.	Title and Contents	No. of hours per practical
1.	Study of general laboratory equipment: Compound Microscope, Autoclave, Laminar Air Flow, Incubator and Hot Air Oven.	04
2.	Study of signs and symptoms of plant diseases caused by bacteria, viruses, MLOs and fungal pathogens.	04
3.	Study of flowering parasitic plants.	04
4.	Study of sterilization techniques.	04
5.	Study of preparation of culture media.	04
6.	Study of plant based pesticides.	04
7.	Study of genetically modified plants. (GM Plants)	04
8.	Study of physical, chemical and biological methods of plant disease management.	04
9.	Determination of soil moisture from given soil sample.	04
10.	Determination of soil pH of given soil sample.	04
11.	Preparation of temporary slides of fungal structures from naturally infected plant material.	04
12.	Determination of soil texture by sedimentation (jar) method.	04
13.	Determination of capillary water movement in different soil types.	04
14.	Determination of soil bulk density.	04
15.	Determination of water holding capacity of soil.	04

Reference Books:

1. Agrios, G. N. (2005). *Plant Pathology* (5th ed.). Elsevier Academic Press, Burlington, MA.
2. Mehrotra, R. S., & Aggarwal, A. (2017). *Plant Pathology* (3rd ed.). McGraw Hill Education (India) Pvt. Ltd., New Delhi.
3. Aneja, K. R. (2012). *Experiments in Microbiology, Plant Pathology and Biotechnology* (4th ed.). New Age International Publishers, New Delhi.
4. Singh, R. S. (2017). *Introduction to Principles of Plant Pathology* (5th ed.). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Brady, N. C., & Weil, R. R. (2017). *The Nature and Properties of Soils* (15th ed.). Pearson Education.
6. Das, D. K. (2014). *Introductory Soil Science* (4th ed.). Kalyani Publishers, Ludhiana.
7. Jackson, M. L. (1973). *Soil Chemical Analysis*. Prentice Hall of India Pvt. Ltd., New Delhi.
8. ICAR. (2020). *Practical Manual of Plant Pathology and Soil Science*. Indian Council of Agricultural Research (ICAR), New Delhi.

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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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Botany	
	Programme: B. Sc.	Semester – I
	Type: DSC III	Marks: 50
	Credits: 2	From: A. Y. 2024-25
	Name of the Course: BPPT 121: Biofertilizer Production Technology	

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

- 1) Explain the concepts and importance of biofertilizers and biopesticides.
- 2) Demonstrate techniques for culturing and mass multiplication of beneficial microorganisms.
- 3) Examine biofertilizer production and quality management methods.
- 4) Apply biofertilizers and biopesticides for sustainable agriculture.

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

- 1) Identify different biofertilizers, biopesticides, and beneficial microorganisms.
- 2) Perform basic techniques for culturing and application of microbial inoculants.
- 3) Analyze biofertilizer production methods and formulations.
- 4) Apply biofertilizer and biopesticide technologies in crop production.

Module	Title and Contents	Hrs.
Module 1	Module 1: Introduction to Biofertilizer 1.1 Introduction, definition and importance of biofertilizer. 1.2 Types of fungal biofertilizer: Trichoderma and Rhizobium 1.3 Outline of production technology of biofertilizer- isolation, selection of strain, preparation of mother culture, starter culture, mass culturing methods. 1.4 Mode of application and its advantages.	08
Module 2	Module 2: Culture of Bacterial and Fungal Biofertilizers 2.1 <i>Azotobacter</i> : Mass multiplication, maintenance of culture, application and crop response. 2.2 <i>Azospirillum</i> : Mass multiplication, maintenance of culture, application and crop response. 2.3 <i>Anabaena</i> : Characteristics, <i>Azolla- Anabaena</i> association, <i>Azolla</i> production and application. 2.4 VAM: Characteristics. Examples. Isolation and single spore culture.	07
Module 3	Module 3: Biofertilizer Production Technology	08

	3.1 PSM: Isolation, mass inoculum production and field application 3.2 Culturing of microorganisms: Fermentation method, Bioreactor and protocol 3.3 Inoculant formulations: Carrier properties, Types of formulation – Powders, Granules and Liquid 3.4 Quality management of biofertilizer.	
Module 4	Module 4: Biopesticide and Application 4.1 Biological control agents and their characteristics 4.2 Types of biopesticides: Bacterial, Fungal and Viral advantages and disadvantages 4.3 Properties of botanical biopesticides: pesticide products in Azadirachta, Pongamia and Annona 4.4 Characteristics of biological fungicides: <i>Trichoderma</i>, <i>Pseudomonas</i> and <i>Fusarium</i> species, Production and processing of biological fungicides.	07
Reference Books: 1. Kannaiyan, S., ed. <i>Biofertilizers for Sustainable Crop Production</i>. Jodhpur: Scientific Publishers (India), 2002. 2. Maheshwari, D. K., ed. <i>Bacteria in Agrobiolgy: Plant Probiotics</i>. Berlin: Springer, 2012. 3. Palanna, K. B. <i>Biofertilizer and Biopesticide Production Technology</i>. New Delhi: New India Publishing Agency, 2020. 4. Somasegaran, P., and H. J. Hoben. <i>Handbook for Rhizobia: Methods in Legume–Rhizobium Technology</i>. New York: Springer-Verlag, 1994. 5. Subba Rao, N. S. <i>Soil Microbiology</i>. 5th ed. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 2017. 6. Vyas, S. C., S. Vyas, and H. A. Modi. <i>Biofertilizers and Organic Farming</i>. Nadiad: Akta Prakashan, 1998.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I: 10 Marks: Home Assignment • CCE - II: 10 Marks: Short and long answer questions Test/Seminar/Open Book Test/Quiz/Case study/Book review/Field work/ Industry visit • CCE- III: 10 marks: Compulsory MCQ test • (Note: 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 – I
	Type: DSC IV	Marks: 50
	Credits: 2	From: A. Y. 2024-25
Name of the Course: BPPT 122: Principles of Organic Farming		
Course Objectives: By the end of the course, students will be able to: 1) Explain the concepts and principles of organic farming. 2) Demonstrate organic farm and resource management practices. 3) Analyze the characteristics and management of problem soils. 4) Apply biofertilizers and organic nutrient management techniques.		
Course Outcomes: By the end of the course, students should be able to: 1) Describe the principles and practices of organic farming. 2) Demonstrate organic farming and soil management techniques. 3) Analyze different types of problem soils and their management. 4) Apply biofertilizers and organic nutrient sources for sustainable agriculture.		
Module	Title and Contents	Hrs.
Module 1	Module 1: Introduction to organic farming 1.1 Definition. Concept, principles, need of organic farming and its scope 1.2 Types of organic farming, benefits and limitations of organic farming 1.3 Advantages and disadvantages of organic farming 1.4 Initiative taken by the central and state governments, NGOs and other organizations for promotion of organic agriculture in India.	08
Module 2	Module 2: Fundamentals of organic farming 2.1 Fundamentals of organic farm management. 2.2 Land management in organic farming. 2.3 Water management in organic farming.	07
Module 3	Module 3: 3.1 Factors responsible for land degradation and characteristics of different types of wastelands 3.2 Saline and sodic soils: Occurrence, Classification, Formation, Diagnosis characteristics and management 3.3 Acidic soil: Occurrence, Formation, Diagnosis, Characteristics and Management 3.4 Water-logged soils: Occurrence, Characteristics and management	08

	3.5 Eroded soils: Occurrence characteristics and management	
Module 4	Module 4: Biofertilizer Production and Organic Nutrient Management 4.1 Phosphate Solubilizing Microorganisms (PSM): Isolation, mass inoculum production and field application 4.2 Biofertilizer Formulations and Quality Management: Carrier materials, powder, granule and liquid formulations, quality control and storage 4.3 Organic Nutrient Sources: Farmyard Manure (FYM), Compost and Vermicompost—preparation, methods of composting and decomposition process. 4.4 Green Manuring: Types, nutrient availability, advantages and limitations	07
Reference Books: 1. Bhattacharyya, P., and D. K. Chakraborty. <i>Organic Farming: Principles and Practices</i>. New Delhi: Kalyani Publishers, 2015. 2. Gopalakrishnan, S., A. Srinivas Rao, and O. P. Rupela. <i>Organic Farming: Principles and Practices</i>. Hyderabad: Scientific Publishers, 2017. 3. Lampkin, Nicholas. <i>Organic Farming</i>. Ipswich: Old Pond Publishing, 2002. 4. Palaniappan, S. P., and K. Annadurai. <i>Organic Farming: Theory and Practice</i>. Jodhpur: Scientific Publishers, 2008. 5. Subba Rao, N. S. <i>Soil Microbiology</i>. 5th ed. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 2017. 6. Kannaiyan, S., ed. <i>Biofertilizers for Sustainable Crop Production</i>. Jodhpur: Scientific Publishers, 2002. 7. Brady, N. C., and R. R. Weil. <i>The Nature and Properties of Soils</i>. 15th ed. Boston: Pearson Education, 2017. 8. Das, D. K. <i>Introductory Soil Science</i>. 4th ed. Ludhiana: Kalyani Publishers, 2014.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I: 10 Marks: Home Assignment • CCE - II: 10 Marks: Short and long answer questions Test/Seminar/Open Book Test/Quiz/Case study/Book review/Field work/ Industry visit • CCE- III: 10 marks: Compulsory MCQ test • (Note: 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 – I
	Type: DSC P	Marks: 50
	Credits: 2	From: A. Y. 2024-25
	Name of the Course: Practical Course-BPPP 123: (Based on theory paper BPPT 121 and BPPT 122)	

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

- 1) Explain isolation and culture techniques of beneficial microorganisms.
- 2) Demonstrate preparation methods of biofertilizers, biopesticides, and organic manures.
- 3) Analyze biofertilizer formulations and carrier materials.
- 4) Apply microbial technologies for sustainable agriculture.

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

- 1) Identify biofertilizers and biocontrol agents.
- 2) Perform microbial isolation and culture techniques.
- 3) Prepare organic manures and biopesticide formulations.
- 4) Apply biofertilizer and biopesticide practices in agriculture.

Practical No.	Title and Contents	No. of hours per practical
1.	Study of Isolation and culture of <i>Rhizobium</i> , <i>Azotobacter</i> , and <i>Azospirillum</i> .	04
2.	Study of Isolation of Phosphate Solubilizing Microorganisms (PSM).	04
3.	Study of Isolation of Vesicular Arbuscular Mycorrhiza (VAM) spores from soil samples.	04
4.	Study of Isolation and culture of <i>Trichoderma</i> , <i>Pseudomonas</i> , and <i>Fusarium</i> species.	04
5.	Study of Isolation and culture of <i>Bacillus thuringiensis</i> , <i>Metarhizium</i> , and <i>Beauveria bassiana</i> .	04
6.	Identification of important biofertilizers and biological control agents.	04
7.	Preparation of Farmyard Manure (FYM) and compost.	04
8.	Preparation of Vermicompost and Vermiwash.	04
9.	Preparation of Enriched Compost.	04
10.	Preparation of botanical pesticides from <i>Azadirachta</i> , <i>Pongamia</i> , or <i>Annona</i> .	04
11.	Preparation of <i>Trichoderma</i> -based fungal biopesticide formulation.	04
12.	Demonstration of biofertilizer application methods (seed treatment, root dip and soil application).	04
13.	Demonstration of dosage calculation for biofertilizers and biopesticides.	04
14.	Study of different carrier materials used in biofertilizer formulations.	04

15.	Study of preparation of liquid biofertilizer formulation.	04
Reference Books: 1. Aneja, K. R. <i>Experiments in Microbiology, Plant Pathology and Biotechnology</i>. 4th ed. New Delhi: New Age International Publishers, 2012. 2. Edwards, C. A., and J. R. Lofty. <i>Biology of Earthworms</i>. London: Chapman and Hall, 1977. 3. Gopalakrishnan, S., A. Srinivas Rao, and O. P. Rupela. <i>Organic Farming: Principles and Practices</i>. Hyderabad: Scientific Publishers, 2017. 4. Kannaiyan, S., ed. <i>Biofertilizers for Sustainable Crop Production</i>. Jodhpur: Scientific Publishers (India), 2002. 5. Maheshwari, D. K., ed. <i>Bacteria in Agrobiolgy: Plant Probiotics</i>. Berlin: Springer, 2012. 6. Palanna, K. B. <i>Biofertilizer and Biopesticide Production Technology</i>. New Delhi: New India Publishing Agency, 2020. 7. Subba Rao, N. S. <i>Soil Microbiology</i>. 5th ed. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 2017. 8. Vyas, S. C., S. Vyas, and H. A. Modi. <i>Biofertilizers and Organic Farming</i>. Nadiad: Akta Prakashan, 1998		
Evaluation Pattern		
Total Marks: 50		
Internal Evaluation (20 marks): • Journal: 10 Marks • Students Performance: 10 Marks		End Semester Examination (30 Marks): • 4 questions

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