

**Karmaveer Bhaurao Patil University, Satara**

**Yashavantrao Chavan Institute of Science,  
Satara  
(Autonomous)**

**Syllabus For  
B. Sc. I (Plant Protection)  
As Per NEP-2020**

**w.e.f. 2023 - 2024**

Karmaveer Bhaurao Patil University, Satara  
**Yashavantrao Chavan Institute of Science, Satara**  

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**Bachelor of Science (B. Sc.) Part - I: Plant Protection**

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1. TITLE: **Plant Protection**

2. YEAR OF IMPLEMENTATION: **2023 - 2024**

3. **PREAMBLE:**

The B. Sc. Plant Protection course under autonomy will be effective from the academic year 2023 - 2024. It has been prepared to keep in view the unique requirements of B. Sc. Plant Protection students as per NEP-2020. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences. The emphasis is to provide students with the latest information along with due weightage to the concepts of Plant Protection so that they can understand and appreciate the current interdisciplinary approaches in the study of plant sciences and their role in societal development. The course content also lists new practical exercises so the students get a hands-on experience with the latest techniques that are currently in use. The course will also inspire students to pursue higher studies in Plant Protection, Botany for becoming an entrepreneur, and enable students to get employed in plant-based industries like Seed agrochemical industries.

4. **General Objectives of the Course:**

- i. To impart knowledge of Plant Protection is the basic objective of this course.
- ii. To develop a scientific attitude among the students and to make the students open-minded, critical, and curious.
- iii. To develop skills in practical work, experiments, and laboratory materials.
- iv. To understand scientific terms, concepts, facts, phenomenon, and their relationships.
- v. To make the students aware of Agro-industry and the environment.
- vi. To enable the students to acquire knowledge of plants (crops) and related subjects to understand nature and the environment to fulfill basic needs like food, fodder and clothing.
- vii. To develop the ability for the application of acquired knowledge to improve agriculture and related fields to make themselves self-reliant.

5. **DURATION:** 01 year

6. **PATTERN:** CBCS Semester

7. **MEDIUM OF INSTRUCTION:** English

8. **STRUCTURE OF COURSE:**

**Course Structure as per NEP-2020**

Level	Sem.	Subject - 1 Major				Subject - 2 Minor		Subject - 3 GE / OE		VSEC		AEC, VEC, IKS			OJT, FP, CEP, CC, RP				Total	Non - CGPA
		DSC		DSE		T	P	T	P	VSC	SEC	AEC	IKS	VEC	CC	FP	CEP	OJT /Int/App /RT		
		T	P	T	P															
4.5	I	4	2	---	---	4	2	4	2				2		2	---			22	
	II	4	2	---	---	4	2	4	2		2		---	2		---			22	DEGG
5	III	4	4	---	---	2	2			2	2	4	---	2					22	
	IV	4	4	---	---	2	2			2	2	4	---		2				22	
5.5	V	4	2	4	2	---	---	---		4			---		2	2	2		22	
	VI	4	2	4	2	---	---	---		2					2	2		4	22	IIC
6	VII	8	2	8		4	---	---		---		---	---		---				22	
	VIII	8	2	8		---	---	---		---		---	---		---			4	22	
<b>Total</b>		<b>40</b>	<b>20</b>	<b>24</b>	<b>4</b>	<b>16</b>	<b>8</b>	<b>12</b>	<b>10</b>	<b>6</b>	<b>8</b>	<b>2</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>8</b>	<b>176</b>		
		<b>88</b>				<b>24</b>		<b>12</b>		<b>16</b>		<b>14</b>			<b>22</b>					

### 1) FIRST SEMESTER

Sr. No.	Subject Title	Theory					Practical	
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Plant Protection (Major)	Course – I BBPT 111	Fundamentals of Plant Pathology	4	4	Practical Course - I -BBPT 113	4	2
		Course - II BBPT 112	Fundamentals of Soil Science					
2.	Plant Protection (Minor)	Course – I -BBPT 114	Farming System and Farm Management	4	4	Practical Course - I - BBPT116	4	2
		Course – II- BBPT115	Agricultural Waste Management					
3.	Generic Elective (For Plant Protection Major Students)	Course – I	Agricultural Economics-I	4	4	Practical Course - I	4	2
		Course – II	Agricultural Economics-II					
	Open elective(For other faculty students)	Course – IBBPT 117	Organic Farming-I	4	4	Practical Course - I BBPT 119	4	2
		Course – II BBPT 118	Organic Farming-II					
4.	IKS	Course - IIKS101	Indian Agriculture	3	2	--	--	--
5	Cocurricular Course	CC102			2	--	--	--

### 2) SECOND SEMESTER

Sr. No.	Subject Title	Theory					Practical	
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Plant Protection (Major)	Course – III- BBPT121	Biofertilizer Production Technology	4	4	Practical Course - II- BBPP123	4	2
		Course – IV- BBPT122	Principles of Organic Farming					
2.	Plant Protection	Course – III-BBPT	Economically Beneficial	4	4	Practical Course -	4	2

	(Minor)	124	Insects			II-BBPP126		
		Course – IV-BBPT 125	Seed Pathology					
3.	Generic Elective (For Plant Protection Major Students)	Course – III	Agricultural Economics-III	4	4	Practical Course - II	4	2
		Course – IV	Agricultural Economics-IV					
	Open elective(For other faculty students)	Course – III BBPT 127	Organic Farming-III	4	4	Practical Course - II-BBPP 129	4	2
	Course – IV BBPT 128	Organic Farming IV						
4.	SEC	Course - I SEC103	Sustainable Agricultural Practices	3	2	--	--	--
5	VEC (Value Education Courses)	VEC104	Digital Technology		2	--	--	--

## 2) Structure and titles of Courses of B. Sc. Course

### B. Sc. I Semester I

#### Plant Protection (Major)

Course I BBPT 111: Fundamentals of Plant Pathology

Course II BBPT 112: Fundamentals of Soil Science

Practical Course BBPP 113: Practicals based on Theory Courses I and II

#### Plant Protection (Minor)

Course I BBPT 114: Farming System and Farm Management

Course II BBPT 115: Agricultural Waste Management

Practical Course BBPP 116: Practicals based on Theory Courses I and II

#### Generic Elective

Course I: Agricultural Economics

Course II: Agricultural Economics

Practical Course: Practical's based on Theory Courses I and II

#### Open Elective

Course I BBPT 117: Organic Farming -I

Course II BBPT 118: Organic Farming -II

Practical Course BBPP 119: Practicals based on Theory Course I & II

#### IKS (Indian Knowledge System)

Course I IKS 101: Indian Agriculture

**CC (Cocurricular Course) CC102**

**B. Sc. I Semester II**

**Plant Protection (Major)**

Course III BBPT 121: Farming system and Farm Management

Course IV BBPT 122: Agricultural Waste Management

Practical II BBPP 123: Practicals based on Theory Courses III and IV

**Plant Protection (Minor)**

Course III BBPT 124: Economically Beneficial Insects

Course IV BBPT 125: Seed Pathology

Practical II BBPP 126: Practicals based on Theory Courses III and IV

**Generic Elective**

Course III: Agricultural Economics

Course IV: Agricultural Economics

Practical II: Practicals based on Theory Courses III and IV

**Open Elective**

Course III BBPT 127: Organic Farming I

Course II BBPT 128: Organic Farming II

Practical II BBPP 129: Practicals based on Theory Courses III and IV

**SEC (Skill Enhancement Course)**

Course I SEC 103: Sustainable Agricultural Practices

**VEC (Value Education Courses) VEC 104 -Digital Technology**

**3) 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's and Chemicals:**

1. All Chemicals required for plant pathological experiments
2. Microscope with a digital camera
3. Digital weighing balance

4. pH meter
5. Microtome
6. Autoclave
7. Hot Air Oven
8. Incubator
9. Refrigerator
10. Seed Dresser
- 11 Hand Refractometer

# **SEMESTER - I**



Karmaveer Bhaurao Patil University, Satara  
**Yashavantrao Chavan Institute of Science, Satara**  
**Syllabus to be introduced from June 2023**

**Bachelor of Science (B. Sc.) Part - I: Plant Protection (Major)**

**Semester I**

**Course I (BBPT 111)**  
**Fundamentals of Plant Pathology**

**Course Objectives:**

**The Students should be able to...**

1. understand the basic knowledge about plant diseases.
2. imbibe the knowledge of effect of environmental factors on disease development.
3. gain the knowledge about principles of plant disease management.
4. impart the knowledge about management of crop diseases by IDM.

Credits (2)	Theory Course I (BBPT 111)	No. of hours (30)
<b>Unit I</b>	<b>Concept of Plant Diseases</b>	<b>(8)</b>
	1.1 Introduction to the Science of plant pathology: Its Importance, Scope and Causes of Plant Diseases 1.2 Terminologies in Plant Pathology, Disease triangle Concept. 1.3 Symptoms and signs of plant diseases. 1.4. Dissemination of plant pathogens. 1.5 Survival of plant pathogens. 1.6 Flowering Parasitic Plants.	
<b>UNIT II</b>	<b>Effect of Environmental Factors on Disease Development</b>	<b>(7)</b>
	2.1 Effect of temperature moisture, rainfall, relative humidity, soil moisture, wind, light, soil pH, soil type, host-plant nutrition, pollutants. 2.2 Plant disease epidemiology: Simple interest diseases, Compound interest diseases, Slow and rapid epiphytotic.	
<b>UNIT III</b>	<b>Principles of Plant Disease Management</b>	<b>(7)</b>
	i) Avoidance ii) Exclusion iii) Eradication iv) Protection	

	v) Immunization vi) Therapy	
<b>UNIT IV</b>	<b>Integrated Disease Management</b>	<b>(8)</b>
	4.1 Definition of IDM, concept and definition of IDM. 4.2 Main components of integrated disease management (IDM). 1. Host resistance 2. Induced systemic resistance 3. Genetically improved plants 4. Physical methods ,Biological method, Cultural methods 5. Plant nutrition 6. Use of pesticides of plant origin 7. Judicious use of chemicals	

**Course Outcomes:**

**The students will be able to...**

1. explain effect of environmental factors on disease development.
2. get the knowledge about epidemiology.
3. apply the methods used for plant disease management.
4. gain the knowledge about use of plant originated pesticide .

**Reference Books:**

1. Jain V., 2009 “Laboratory Manual of Plant Pathology”. Oxford Book, Calcutta.
2. Agrios G. 2005 “Plant Pathology”. (5<sup>th</sup>Edn.), Academic Press, San Diego.
3. Aneja K., 2005. “Experiments in Microbiology Plant Pathology and Tissue Culture”. New Age International (P) Ltd. Publishers, New Delhi.
4. Bilgrami K. 1990. “Textbook of Modern Plant Pathology”. New edition, New Delhi.
5. Chattopadhyay S., 1987 “Principles and procedures of plant protection”. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
6. Baruah H., 1984 “Text Book of Plant Pathology”. Oxford and IBH Publ. Co., New Delhi.
7. Mehrotra R., and Aggarwal A., 1980 “Fundamentals of Plant Pathology”. McGraw-Hill Education Pvt. Ltd., New Delhi.
8. Butler & Edwin. 1949. “Plant Pathology”. Macmillan & Co.

## Plant Protection (Major)

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### Semester: I

#### Course II (BBPT 112) Fundamentals of Soil Science

**Course Objectives:**

**The students should be able to...**

1. understand the basic knowledge about soil science.
2. imbibe the knowledge of the composition of earth's crust.
3. make the students knowledgeable about the importance of rocks, soil, soil as three-dimensional body and major components of soil.
4. apply the knowledge about Soil Organic Matter, Soil pH and Nutrient Availability.

Credits(2)	Theory Course II (BBPT112)	No. of hours (30)
<b>Unit I</b>	<b>Composition of Earth Crust</b>	<b>(7)</b>
	1.1 Introduction 1.2 Rocks 1.3 Soil 1.4 Land and Soil 1.5 Major component of soil: 1.6 Fundamental Soil Forming Processes	
<b>UNIT II</b>	<b>Soil Classification and Land Capability Classification</b>	<b>(8)</b>
	2.1 Soil Classification 2.2 Soil horizons 2.3 Soil Physical Properties 2.4 Methods of textural analysis 2.4.1. Soil texture by feel method 2.4.2. Hydrometer method (Using Bouyoucos hydrometer) 2.4.3. International pipette method:	
<b>UNIT III</b>	<b>Porosity and Soil Color, Soil Water Movement</b>	<b>(7)</b>
	3.1 Soil Porosity 3.2 Soil Colour 3.3 Factors affecting soil colour and Porosity	

	3.4 Soil Water Movement (Saturated flow, Unsaturated flow, Vapor movement) 3.5 Measurement of Soil Moisture (Gravimetric method)	
<b>UNIT IV</b>	<b>Soil Organic Matter, Soil pH and Nutrient Availability</b>	<b>(8)</b>
	4.1 Introduction, Importance of organic matter	
	4.2 Sources of Soil Organic Matter	
	4.3 Introduction, Importance of Soil pH, Factors affecting soil pH	
	4.4 Nutrient availability	

**Course Outcomes:**

**The students will be able to...**

1. get the knowledge about the basic concepts of Composition of soil in Earth Crust .
2. describe major component and textural analysis of soil.
3. apply the methods used for measurement of soil moisture.
4. gain the knowledge about the soil organic matter, nutrients and carry out practical work in field

**Reference Books:**

1. Plaster, E., 2013. Soil science and management. Cengage learning.
2. Tan, K.H., 2009. Environmental soil science. CRC Press.
3. Havlin J.L., Beaton J.D., Tisdale S.L., & Nelson W.L., 2006. Soil Fertility and fertilizers. 7th Ed. Prentice Hall.
4. Brady N.C. & Weil R.R., 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
5. Yawalkar K.S, Agrawal J.P. & Bokde S., 2000. Manures and Fertilizers. Agri-Horti Publ
6. Prasad R., & Power J.F., 1997. Soil Fertility Management for Sustainable Agriculture. CRC Press.
7. Leeper, G.W., Uren, N. C., 1993. Soil science: an introduction. Melbourne University Press.
8. Foth, H. D., 1951. Fundamentals of soil science. United States of America.

## **Plant Protection (Major)**

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### **Semester I**

#### **Practical Course -I (BBPP 113)**

**Course Objectives:**

**The Students should be able to...**

- 1) familiarize the students with general plant pathological equipment's and pathological procedures (Preparation of culture media, About GM crops, IDM, etc.)
- 2) learn the preparation of Soil Samples for laboratory analysis.
- 3) understand the relationship between the parasitic plants and their host .
- 4) impart the knowledge about integrated disease management .

<b>Credits (2)</b>	<b>Practical Course- I (BBPP 113)</b> <b>(Practicals based on Theory Courses I and II)</b>	<b>No. of hours</b> <b>60</b>
	<ol style="list-style-type: none"><li>1. Study of general plant pathological equipment's like compound microscope, autoclave, laminar air flow, incubators and hot air oven.</li><li>2. Study of Symptoms and signs of plant diseases caused by Bacteria, Viruses, MLO's and fungal pathogens.</li><li>3. Study the characteristics of parasitic flowering plants and their relationship with their hosts.</li><li>4. Study of Preparation of culture media and sterilization.</li><li>5. Study of pesticides with plant origin.</li><li>6. Study of GM plants.</li><li>7. Study of types of Integrated Disease Management (Integration of</li></ol>	

	<p>cultural and chemical control, Integration of chemical and biological control, Integration of resistance, cultural, biological and chemical control).</p> <p>8. Study of collection and preparation of Soil Samples for laboratory analysis.</p> <p>9. Determination of Soil colour and its classification of given Soil samples.</p> <p>10. Determination soil moisture content from given soil samples.</p> <p>11. Determination of Soil pH of given soil samples.</p> <p>12. Determination of Electrical Conductivity (EC) of given Soil samples.</p> <p>13. Determination particle size analysis of given Soil samples.</p> <p>14. Determination of total N, P, K in soil samples.</p> <p>15. Study of Management of Soil health.</p>	
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**Course Outcomes:**

**The students will be able to...**

- 1) learn and use all plant pathological procedures (Preparation of culture media, About GM crops, IDM, etc.)
- 2) demonstrate the methods used for preparation of Soil Samples in laboratory.
- 3) apply the different methods for disease management.
- 4) identify the types of soil by using methods for soil analysis.

**Reference Books:**

1. Jain V., 2009. "Laboratory Manual of Plant Pathology". Oxford Book, Calcutta.
2. Havlin J., Beaton J., Tisdale S., & Nelson W., 2006. "Soil Fertility and fertilizers". 7<sup>th</sup> Ed. Prentice Hall.
3. Agrios G., 2005. "Plant Pathology". (5<sup>th</sup>Edn.), Academic Press, San Diego.
4. Aneja K., 2005. "Experiments in Microbiology Plant Pathology and Tissue Culture". New Age International (P) Ltd. Publishers, New Delhi.
5. Brady N., & Weil R., 2002. "The Nature and Properties of Soils". 13<sup>th</sup> Ed. Pearson Edu.
6. Yawalkar K., Agrawal J., & Bokde S., 2000. "Manures and Fertilizers". Agri-Horti Publ.
7. Prasad R., & Power J., 1997. "Soil Fertility Management for Sustainable Agriculture". CRC Press.
8. Mehrotra R., and Aggarwal A., 1980. "Fundamentals of Plant Pathology". McGraw-Hill Education Pvt. Ltd., New Delhi.

## Plant Protection (Minor)

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### Semester I

#### Theory Course I (BBPT 114)

### Farming System and Farm Management

#### Course objectives:

##### The students should be able to...

1. understand the basic knowledge about farming system.
2. know the types of cropping used in farming.
3. impart the knowledge about principles and management of farm.
4. update the knowledge about various risks and uncertainty in agriculture.

Credits (2)	Theory Course I (BBPT 114 )	No. of hours per unit/ credits
<b>Unit I</b>	<b>Farming System</b>	<b>(8)</b>
	1.1 Farm – Meaning – Definition – its types and characteristics factors determining size of farms	
	1.2 Concepts, Definitions and Classification of farming Systems	
	1.3 Factors determining farming systems: physical, biological and socioeconomic	
	1.4 Characteristics of the small- scale tropical farming systems	
<b>UNIT II</b>	<b>Cropping</b>	<b>(7)</b>
	2.1 Nomadic farming, shifting cultivation, fallow rotation, permanent cultivation, ley farming etc.	
	2.2 Intercropping, mono-cropping, sole cropping, sequential cropping, relay cropping, strip cropping.	
<b>UNIT III</b>	<b>Farm Management</b>	<b>(7)</b>
	3.1 Introduction, Meaning, Definitions, Scope, Objectives,	

	Relationship with other sciences 3.2 Types of farming – Specialization, Diversification, Mixed farming, Dry farming and Ranching. 3.3 Factors influencing types of farming.	
<b>UNIT IV</b>	<b>Risks and Uncertainty in Agriculture</b>	<b>(8)</b>
	4.1 Risk and uncertainty in agriculture 4.2 Nature and sources of risks Production 4.3 Technical risks 4.4 Price or marketing risk 4.5 Financial risk 4.6 methods of reducing risk	

### Course Outcomes:

#### The students will be able to...

1. explain the basic concepts of farming System and management
2. classify intercropping, mono-cropping, sole cropping, sequential cropping.
3. discuss various factors influencing types of farming.
4. create the problem solving methods for risks and uncertainty in agriculture .

### Reference Books:

1. Singh, I.J., 2015. “Elements of Farm Management Economics”. East-West press, Private Limited, New Delhi.
2. Dixon, J., Gulliver, A., Gibbon, D., Hall, M. 2015. A global farming system knowledge base. Experimental Agriculture 24, 399-419.
3. CEC-EEA., 2012. CORINE Land Cover; <http://land.copernicus.eu/pan-european/corine-land-cover/clc-2012/view>
4. Sanchez, B., Medina, F., Iglesias, A., 2013. Typical systems and trends in crop and soil management in Europe. Sustainable farm management aimed at reducing threats to soils under climatic change. (SMART Soil) Report. Deliverable 2.2.
5. Johl, S.S. and Kapur J.R., 2011. “Fundamentals of Farm Business Management”. Kalyani Publishers, New Delhi,
6. Andersen, E., 2010. Regional typologies of farming systems contexts. System for Environmental and Agricultural Modelling; Linking European Science and Society (SEAMLESS) Report. PD.4.4.3.
7. Lewis, L., and Tietenberg, T.H., 2000. “Environmental and Natural Resource Economics”. (11th Edn.) Routledge, T&F, New Delhi.



8. Sankhyan, P.L., 1983. "Introduction to Farm Management". Tata – McGraw – Hill Publishing Company Ltd, New Delhi.

## Plant Protection (Minor)

### Semester I

#### Course II (BBPT 115)

#### Agricultural Waste Management

**Course Objectives:**

**The students should be able to...**

1. know the management and disposal of agricultural waste chemicals.
2. understand the typical dairy waste management
3. explain the energy production by agricultural waste.
4. impart the knowledge about production of ethanol from molasses and the cultivation of mushroom on bagasse.

Credits (2)	Theory Course II (BBPT 115 )	No. of hours per unit/ credits
<b>UNIT I</b>	<b>Principles &amp; Fundamentals of Agricultural Waste Management</b>	<b>(8)</b>
	1.1 Principles of agricultural waste management. 1.2 Addressing animal and human waste. 1.3 Management and disposal of agricultural chemicals. 1.4 Waste management function.	
<b>UNIT II</b>	<b>Agricultural Waste Management Systems</b>	<b>(7)</b>
	2.1 Basic functions of AWMS: Production; Collection; Transfer; Storage; Treatment; Utilization. 2.2 Typical agricultural waste management systems: Dairy waste management systems; sugarcane waste management systems; Agricultural chemical waste management.	
<b>UNIT III</b>	<b>Agricultural Waste and Energy Production</b>	<b>(7)</b>
	3.1 Thermochemical conversion: incineration, pyrolysis, gasification of waste using gasifiers, environmental and health impacts of incineration; strategies for reducing environmental impacts. 3.2 Energy production from wastes through incineration. 3.3 Bio-chemical Conversion: Anaerobic digestion of waste, agro residues, anaerobic digestion biogas production, and present status of technologies for conversion of waste into energy,	

	design of waste to energy plants for villages. 3.4 Cultivation of algal biomass from wastewater and energy production from algae.	
<b>UNIT IV</b>	<b>Local Case Study of Agricultural Waste Management: Sugarcane</b>	<b>(8)</b>
	4.1 Ethanol from molasses. 4.2 Co-generation of electricity. 4.3 Course production from sugarcane waste. 4.4 Mushroom cultivation on bagasse.	

#### Course Outcomes:

##### The students will be able to...

1. apply knowledge of basic science to achieve agricultural waste management and its significance in the socio-economic development
2. identify, formulate and design environment friendly solutions to waste management.
3. apply best waste management practices for securing ecologically sustainable development.
4. communicate and manage interdisciplinary teams in solving waste management problems

#### Reference Books:

1. Agrawa P, Kumar A. and Srivastava A., 2021. Agricultural-Domestic Waste Management in India. International Journal of Modern Agriculture vol 10 (2): 2145 - 2154.
2. Lakshmi, P.V., Singh, S.K., Pramanick, B., Kumar, M., Laik, R., Kumari, A., Shukla, A.K., Abdel Latef, A.A.H., Ali,O.M., Hossain, A., 2021. Long term zinc fertilization in calcareous soils improves wheat (*Triticum aestivum* L.) productivity and soil zinc status in the rice-wheat cropping system. Agronomy 11: 1306.
3. Brown R., 2019. "Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power". John Wiley and Sons, USA.
4. Zakaria Z., 2018. "Sustainable Technologies for the Management of Agricultural Wastes". Springer, New Delhi.
5. Akhtar N., Goyal D. and Goyal A., 2017. Characterization of microwave-alkali-acid pre-treated rice straw for optimization of ethanol production via simultaneous saccharification and fermentation (SSF). Energy Conversion and Management vol 141: 133-144.
6. Ptasinski K., 2016. Efficiency of Biomass Energy: An Energy Approach to Biofuels, Power, and Biorefineries. John Wiley & Sons, USA
7. Capareda S., 2013. "Introduction to Biomass Energy Conversions". CRC Press, USA.
8. Loehr R., 1974. "Agricultural Waste Management: Problems, Processes, and Approaches". Academia press, USA.

## Plant Protection (Minor)

### Semester I

#### Practical Course I – (BBPP 116)

**Course Objective:**

**The students will be able to...**

- 1) familiarize the students with farming system and farm management
- 2) imparts the knowledge about agricultural Waste Management
- 3) understand the Knowledge about risk and uncertainty in agriculture.
- 4) explain the knowledge about Farm chemical storage and disposal .

Credits (2)	<b>Practical Course -I ( BBPP 116 ) ( Practicals based on Theory Courses I and II)</b>	No. of hours ( 60 )
	<ol style="list-style-type: none"><li>1. Study of farm management aspects.</li><li>2. Study of Preparation of farm plans for cash crops.</li><li>3. Study of Preparation of farm plans for cereal crops.</li><li>4. Study of Preparation of farm plans for Oil yielding crops and Fodder crops.</li><li>5. Study of preparation of farm plans for fodder crops.</li><li>6. Study of Plans for application of fertilizers.</li><li>7. Study of Management of Intercropping (any three examples/ plans)</li><li>8. Study of risks and uncertainty in agriculture.</li><li>9. Study and nutrient analysis of dairy animal waste composting.</li><li>10. Study of practical guidelines for assessment of effective utilization of agricultural waste.</li><li>11. Study of farm chemical storage and disposal.</li><li>12. Study of use of lignocellulosic matter as a source for biofuel/biogas.</li><li>13. Use of paddy straw agricultural waste for energy production (Mushroom cultivation).</li><li>14. Study of Course production from sugarcane molasses/waste.</li><li>15. Visit to an electricity generation plant associated with nearby</li></ol>	

**Course Outcomes:****The Students will be able to...**

- 1) explain all types of Procedure related to farming system and farm management
- 2) discuss about the importance of agricultural waste management for farming.
- 3) apply the knowledge of management of Intercropping .
- 4) demonstrate the use paddy straw for mushroom cultivation.

**Reference Books:**

1. Lakshmi, P.V., Singh, S.K., Pramanick, B., Kumar, M., Laik, R., Kumari, A., Shukla, A.K., Abdel Latef, A.A.H., Ali,O.M., Hossain, A., 2021. Long term zinc fertilization in calcareous soils improves wheat (*Triticum aestivum* L.) productivity and soil zinc status in the rice-wheat cropping system. *Agronomy* 11: 1306.
2. Brown R., 2019. “Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power”. John Wiley and Sons, USA.
3. Akhtar N., Goyal D. and Goyal A., 2017. Characterization of microwave-alkali-acid pre-treated rice straw for optimization of ethanol production via simultaneous saccharification and fermentation (SSF). *Energy Conversion and Management* vol 141: 133-144.
4. Singh I.J., 2015. “Elements of Farm Management Economics”. East-West press, Private Limited, New Delhi.
5. Ptasinski K., 2016. *Efficiency of Biomass Energy: An Energy Approach to Biofuels, Power, and Biorefineries*. John Wiley & Sons, USA.
6. Capareda S., 2013. “Introduction to Biomass Energy Conversions”. CRC Press, USA.
7. Johl S., and Kapur J., 2011. “Fundamentals of Farm Business Management”. Kalyani Publishers, New Delhi.
8. Lewis L., and Tietenberg T.H., 2003. “Environmental and Natural Resource Economics”. (11<sup>th</sup> Edn.) Routledge, T&F, New Delhi.

## Plant Protection (Open Elective)

### Course I (BBPT 117)

#### Organic Farming Course I -Organic Agriculture

##### Course Objectives:

##### The students should be able to...

1. understand the knowledge about pollution, enemies of crop pests, and threats to Bio diversity.
2. know about the importance and types of organic farming.
3. Impart the knowledge about characteristics and types of soil.
4. explain the knowledge about cultivation & Irrigation system.

<b>Credits (2)</b>	<b>Theory Course I (BBPT 117)</b>	<b>No. of hours(30)</b>
<b>Unit I</b>	<b>Organic Agriculture</b>	<b>(8)</b>
	1.1 Detrimental effects of currently chemical dependent farming Reduction of crop production due to depletion of soil Health. 1.2 Pesticide contamination and human health hazard. Contamination of food products by pesticides & chemicals. 1.3 Environmental (soil, water, air) pollution. Reduction of natural enemies of crop pests. Threat to Bio diversity.	
<b>UNIT II</b>	<b>Types of Farming</b>	<b>(7)</b>
	2.1 Pure Organic Farming – Definition, Concept & Benefits 2.2 Integrated Farming system (Combination of Organic and Inorganic) Mixed Farming 2.3 Concept of different cropping systems in relation to Organic Farming (Inter cropping etc.)	
<b>UNIT III</b>	<b>Organic Horticulture</b>	<b>(8)</b>
	3.1 Introduction to science of organic horticulture; importance and current scenario in India 3.2 Horticultural crops for organic farming: Medicinal: Aloe vera/ Lemon Grass; vegetables: Brinjal/Spinach 3.3 Soil: Definition Soil Formation Composition and characteristic, Types of soil according to composition, Acidic, Alkaline and Saline soils, How they affect Agriculture.	
<b>UNIT IV</b>	<b>Irrigation Practices in Organic Agriculture</b>	<b>(7)</b>

	4.1 Basic Principles in Irrigation 4.2 Water use efficiency & methods of irrigation 4.3 Micro irrigation system – Drip, Sprinkler etc.,	
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**Course Outcomes:**

**The students will be able to.....**

1. learn about pesticide contamination and human health hazard.
2. discuss about advantages, and disadvantages of organic farming.
3. update the knowledge about types and characteristics soil.
4. apply the knowledge about the irrigation systems in field .

**Reference Books:**

1. Heide H., 2016. Working with nature, shifting paradigm. Gaia College Canada publishing, Canada.
2. Reddy S.R., 2011. Principles of Agronomy. Kalyani Publishers, Ludhiana, India.
3. Panda S.C., 2006. Agronomy. Agribios Publication, New Delhi.
4. Rao V.S., 2006. Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.
5. Denckla T., 2004. Gardener's A – Z to Growing Organic Food. Storey Books, England.
6. Tompkins P., and Bird C., 2004. Secrets of the Soil. Rupa Publisher Pvt Ltd., New Delhi.
7. Sankaran S., and V.T., Subbiah Mudliyar, 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
8. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.

**Plant Protection (Open Elective)**

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**Semester I  
Course II (BBPT 118)  
Organic Farming Course II - Farm Management**

**Course Objectives:**

**The students should be able to...**

1. understand the basic knowledge about farm management
2. explain the knowledge of importance and types of farms
3. demonstrate the knowledge about preparation of land.
4. update the knowledge about cultivation of crops.

<b>Credits (02)</b>	<b>Theory Course II (BBPT118 )</b>	<b>No. of hours (30)</b>
<b>Unit I</b>	<b>Farm Designing</b>	<b>(7)</b>
	1.1 Characteristics and components of an organic farm, planning and layout of the farm	
	1.2 Farm components in different Agro Eco-Systems, field crops in organic Farms, buffer zone	
	1.3 Benefits of tree in organic farm, Farm biodiversity.	
<b>UNIT II</b>	<b>Land Preparation for Organic Farming</b>	<b>(8)</b>
	2.1 Implements used for land preparation, factors influencing land preparation, Summer Ploughing, Wetland preparation	
	2.2 Types of tillage, Land preparation for cereal crops & Vegetable crops (any one crop from each group)	
	2.3 Land preparation for Cash crops & Flowering plants.	
<b>UNIT III</b>	<b>Cultural and Mechanical Practices</b>	<b>(7)</b>
	3.1 Pre-Sowing Irrigation, Crop Rotation, Intercropping, Mixed cropping.	
	3.2 Use of tolerant Resistant varieties, Manipulations in sowing dates, Irrigation /flooding.	
	3.3 Weed Management	
<b>UNIT IV</b>	<b>Nursery Operations</b>	<b>(8)</b>
	4.1 Cultivation practices of selected plants viz. varieties, climate, soil, season, field preparation. Planting, spacing,	
	4.2 Irrigation, manuring, plant protection, harvesting and post-harvest handling.	



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

1. aware about importance of farm design in organic farming.
2. learn about farm friendly ploughing and tillage practices.
3. realize the value of resistance varieties as way to reduce pesticides.
4. run nursery operations for vegetable crop plants.

**Reference Books:**

1. Sharma D.N. and Mukesh S. 2013. Farm Machinery Designs: Principles and Problems. 3<sup>rd</sup> Ed. Jain Brothorn, Haryana.
2. Ika D., David G., and Benoit D., 2012. Farming Systems Research into the 21st Century. Springer Publications.
3. Tow P., and Cooper Ian., 2011. Rainfed Farming Systems. Springer Publications.
4. Reddy S.R. 2011. Principles of Agronomy. Kalyani Publishers, Ludhiana, India
5. Rao V.S., 2006. Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India
6. Panda S.C., 2006. Agronomy. Agribios Publication, New Delhi..
7. Sankaran S. and V.T. Subbiah Mudliyar, 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
8. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.

## Plant Protection (Open Elective)

### Semester I Practical Course I (BBPP 119)

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

- 1) familiarize with various characters of soil and the methods of analysis.
- 2) imparts knowledge about plant diseases and IDM.
- 3) understand the relation between parasitic plants and their host plants.
- 4) learn the knowledge about methods used for IDM.

Credits (02)	Practical Course I (BBPP 119) (Practicals based on Theory Course I and II)	No. of hours (60)
<b>Credit II:</b>	<ol style="list-style-type: none"><li>1. Study of Soil and its physical characters.</li><li>2. Study of different types of soil, (Soil types- Alluvial, Laterite, Clay, Loam) etc.</li><li>3. Study of Soil Conditioners: Lime, Dolomite, Gypsum, Basis slag, Organic Manures, etc.</li><li>4. Study of use of soil conditioners for better management of soil, dosages by soil types etc.</li><li>5. Study of Soil testing (Sample collection and processing for analysis).<ol style="list-style-type: none"><li>a) Laboratory method</li><li>b) By soil testing kits</li><li>c) Calculation of different fertilizer requirement of crops as per soil test results.</li></ol></li><li>6. Visit to Organic Farm and Report Writing.</li><li>7. To familiarize the students with general plant pathological equipment's like compound microscope, autoclave, and laminar air flow, incubators and hot air oven.</li><li>8. Study Symptoms and signs of plant diseases caused by Bacteria,</li><li>9. To study the characteristics of parasitic flowering plants and their relationship with their hosts.</li><li>10. Study of pesticides with plant origin.</li><li>11-12. Study of types of Integrated Disease Management (Integration of cultural and chemical control, Integration of chemical and biological control, Integration of resistance, cultural, biological and chemical control)</li><li>13. Study Symptoms and signs of plant diseases caused by Viruses,</li></ol>	

	14. Study Symptoms and signs of plant diseases caused by MLO's 15. Study Symptoms and signs of plant diseases caused by fungal pathogens.	
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**Course Outcomes: The students will be able to:**

- 1) learn about various characters of soil and the methods of analysis.
- 2) handle plant pathological instruments, identify plant diseases and IDM.
- 3) apply the methods used for disease management.
- 4) understand the relationship between parasitic plants and host plants.

**Reference Books:**

1. De Gopal Chandra., 2016. Fundamentals of Agronomy. Oxford and IBH.
2. Sharma D.N., and Mukesh, S., 2013. Farm Machinery Designs: Principles and Problems. 3<sup>rd</sup> Ed. Jain Brothern, Haryana.
3. Ika D., David G., and Benoit D., 2012. Farming Systems Research into The 21st Century. Springer Publications.
4. Reddy S.R., 2011. Principles of Agronomy. Kalyani Publishers, Ludhiana, India.
5. Tow P., and Cooper Ian., 2011. Rainfed Farming Systems. Springer Publications.
6. Panda S.C.. 2006. Agronomy. Agribios Publication, New Delhi.
7. Sankaran S., Subbiah Mudliyar V. T., 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
8. Rao V. S., 1983. "Principles of Weed Science". Oxford and IBH Publishing Co." Pvt. Ltd., New Delhi, India.

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## Plant Protection (IKS)

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**Semester I**  
**Course I (IKS 101)**  
**Indian Agriculture**

**Course Objectives:**

**The students should be able to...**

1. impart knowledge of traditional agricultural practices followed in India.
2. develop awareness about the glorious history of Indian agriculture.
3. make the students knowledgeable about ancient agricultural techniques.
4. empower the students with the ability to compare ancient, medieval, and modern agriculture trends.

Credits (02)	Course I ( IKS 101) Indian Agriculture	No. of hours (30)
<b>Unit I</b>	<b>History of Indian Agriculture</b>	<b>(8)</b>
	1.1 Introduction and importance of Agriculture in India	
	1.2 History of Indian agriculture: The significance of agriculture and irrigation as emphasized in the Indian Mythological texts like Ramayana, Mahabharata and other.  1.3 Mention of Indian agriculture by Greek historians and later travelers.	
<b>Unit II</b>	<b>Ancient Irrigation Techniques</b>	<b>(7)</b>
	2.1 Significance of Agriculture and irrigation for the Kings of Indian tradition.  2.2 Major water bodies of ancient times. The Ery system of south India.	
<b>Unit III</b>	<b>Indian Agriculture Technologies</b>	<b>(8)</b>
	3.1 Excellence of Indian agricultural technologies as observed by more recent European observers.  3.2 Productivity of Indian agriculture in medieval Thanjavur and eighteenth-century Allahabad, Chengalpattu, etc.	

<b>Unit IV</b>	<b>Agriculture and Indian Society</b>	<b>(7)</b>
	4.1 Indian attitude towards agriculture in ancient times. 4.2 Indian attitude towards agriculture in medieval times. 4.3 Indian attitude towards agriculture in modern times.	

**Course Outcomes:**

**The students will be able to...**

1. discuss about ancient Indian agriculture and compare the different ancient agriculture traditions with the current scenario.
2. explain the irrigation techniques in India and demonstrate the various irrigation techniques followed in India.
3. evaluate the effectiveness of different agriculture technologies implemented in India.
4. compare the Indian attitude towards agriculture during the history of India.

**Reference Books:**

1. Basu R.N., Bose T.K., Chakraborty C.S., 2017. History of Science in India - Agricultural Science (Volume V). The National Academy of Science, India (NASI) & the Ramakrishna Mission Institute of Culture, India.
2. Bhadani Bhanwar L., 2012. "Water harvesting, conservation, and irrigation in Mewar (AD 800-1700)."
3. Bunce Fredrick W., 2013. "The iconography of water: well and tank forms of the Indian subcontinent."
4. Ayangarya V. S., 2006. Lokopakara (For the Benefit of People) - An Ancient Text on Indian Agriculture. Asian Agri-History Foundation, India.
5. Chakravarty K.K., Gyani L.B, and. Vijay P., 2006. Traditional Water Mangament Systems of India. New Delhi: Aryan Books.
6. Mukundan T.M., 2005."ery systems of South India."
7. Agarwal A., Narain, S., 1997. Dying Wisdom: Rise, fall and Potential of India Traditional Water-Harvesting Systems. Centre for Science and Environment, New Delhi.
8. Srinivasan Tandantottam M., 1991. Irrigation and Water Supply, South India, 200 BC-1600 AD. South Asia Books.

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# Plant Protection (CC 102)

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## Semester I

### Curricular Course - NSS

#### Course Objectives:

##### The students should be able to.....

1. introduction to Basic concepts of NSS
2. give knowledge about the importance of NSS in Life.
3. inculcate the awareness and preparation of basic awareness of Social important goals for increasing personality development.
4. develop the skill in practical work social attachment.

Sr. No.	Name of Chapter	Period
	<b>Unit I: Introduction to Basic Concepts of NSS:</b>	
1.	1.1 History, philosophy, aims and objectives of NSS, Emblem, flag, motto, song, badge etc. 1.2 Organizational structure, roles and responsibilities of various NSS functionaries. <b>1.3</b> NSS Programmes and Activities: Concept of regular activities, special campaigning, Day Camps, Basis of adoption of village / slums, methodology of conducting survey, financial pattern of the scheme, other youth programme/schemes of GOI, Coordination with different agencies, Maintenance of the Diary.	5
	<b>Unit II: Volunteerism and Shramdan:</b>	
2.	2.1 Indian Tradition of volunteerism. 2.1 Needs and importance of volunteerism, Motivation and Constraints of volunteerism, Shramdan as part of volunteerism, Swatch Bharath. Awareness in Blood donation/Tree plantation/special camps etc.	5
<b>Total Period</b>		<b>10</b>

#### Course Outcomes:

##### The students will be able to.....

1. know the importance of National Service Scheme.
2. develop the personality development.
3. aware about human life and social service
4. know the Role and Responsibilities of NSS.

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# Plant Protection (CC 102)

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## Semester I

### Co-Curricular Course-NSS

#### Course Objectives:

##### The student should be able to.....

1. give the knowledge about the personality development and social service.
2. develop the skill of social awareness.
3. understand the day by day activities of NSS.
4. know the different Achievements of NSS.

Sr. No	Name of Practical	Period
1.	Awareness about the motto of the National Service Scheme.	4
2.	Aware about National Service Scheme awards.	4
3.	Participation in National Service Scheme day to day activities.	6
4	Achievements of the National Service Scheme Social Service Best volunteers Award/ Award'/ National Awards/State level awards/University awards etc.	10
5	Project/ Field Visits survey/ Industrial Visit/Ashram visit/ (06 hr)	6
<b>Total Period</b>		<b>30</b>

#### Course Outcomes:

##### The student will be able to.....

1. development personality development.
2. become good volunteer in society.
3. participate in day by day activities of NSS.
4. know about the achievements of NSS

#### Reference Books:

1. "Ministry of Youth Affairs and Sports".
2. "National Service Scheme Ministry of Youth Affairs and Sports Go I"

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## Plant Protection (CC 102)

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### Semester I

### Curricular Course-NSS

### CCT1: Introduction to National Cadet Corps (Credits 1)

Sr. No.	Name of Chapter	Period
1	<b>Unit 1: Introduction</b> 1.1 History and Introduction to NCC, NCC Motto. 1.2 How to join NCC, Aim of NCC, NCC flag. 1.3 NCC Song. 1.4 Organizational Structure of NCC.	(7)
2.	<b>Unit 2: NCC Training</b> 2.1 Introduction to NCC training activities, 2.2 Need for and Importance of NCC training, 2.3 Types of NCC training: Institutional Training Camps and 2.5 Attachment Training, Social Service and Community Development Activities, Youth Exchange Programme (YEP), Adventure Training and Sports. 2.5 Cadet Induction in NCC, Eligibility Conditions for Certificate Examination	(8)
<b>Total Period</b>		<b>(15)</b>

### CCP1: Introduction to National Cadet Corps (Credits 1)

1. NCC motto Demonstration
2. NCC Organization Presentation
3. NCC Song
4. Participation in NCC Community Development Activity 1
5. Participation in NCC Community Development Activity 1



## **SEMESTER - II**

Karmaveer Bhaurao Patil University, Satara  
**Yashavantrao Chavan Institute of Science, Satara**  
**Syllabus to be introduced from June 2023**

**Bachelor of Science (B. Sc.) Part - I: Plant Protection (Major)**

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**Theory Course III (BBPT 121)**  
**Semester II**

**Biofertilizer Production Technology**

**Course Objectives:**

**The students should be able to...**

1. know the basic knowledge about Biofertilizers.
2. understand the knowledge about the mass culturing of biofertilizers.
3. impart the knowledge about the culture of bacterial and fungal biofertilizers.
4. learn the knowledge about botanical and fungal biopesticides.

Credits (2)	Theory Course III(BBPT 121)	No. of hours (30)
<b>Unit I</b>	<b>Introduction to Biofertilizers</b>	<b>(8)</b>
	1.1 Introduction, definition, importance and advantages. 1.2 Classification of biofertilizers, sources of biofertilizers- Bacteria, Cyanobacteria Mycorrhiza 1.3 Outlines of production technology of biofertilizers- isolation, selection of strain, preparation of mother culture, starter culture, mass culturing. 1.4 Rhizobium Mass multiplication, starter culture, mass cultivation, inoculant formulations and application method.	
<b>UNIT II</b>	<b>Culture of Bacterial and fungal Biofertilizers</b>	<b>(7)</b>
	<b>2.1 Azatobacter-</b> Mass multiplication, maintenance of culture, application and crop response. <b>2.2 Azospirillum-</b> Mass multiplication, inoculant formulations, associative effect and crop response. <b>2.3 Anabaena-</b> Characteristics, <i>Azolla-</i> , <i>Anabaena</i> association, <i>Azolla</i> production and application. <b>2.4VAM-</b> massproduction-substrate, substrate free, in-vitro methods and crop response.	
<b>UNIT III</b>	<b>Biofertilizer Production Technology</b>	<b>(8)</b>
	<b>3.1 PSM:</b> Isolation, mass inoculum production and field application.	

	<p><b>3.2 Culturing of microorganisms:</b> Fermentation Method- Bioreactor and protocol.</p> <p><b>3.3 Inoculant formulations:</b> Carrier properties, Types of formulations: Powders, Granules and Liquids.</p> <p><b>3.4</b> Quality Management of biofertilizers</p>	
<b>UNIT IV</b>	<b>Botanical and fungal biopesticides</b>	<b>(7)</b>
	<p><b>4.1</b> Biological control agents and their characteristics.</p> <p><b>4.2</b> Types of biopesticides– bacterial, fungal and viral ; advantages and disadvantages.</p> <p><b>4.3</b> Properties of botanical biopesticides; pesticide products in <i>Azadirachta, Pongamia and Annona</i>.</p> <p><b>4.4</b> Characteristics of biological fungicides- <i>Trichoderma, Pseudomonas</i> and <i>Fusarium</i> species; production and processing of biological fungicides</p>	

**Course outcome:**

**The students will be able to...**

1. discuss about the importance of biofertilizers.
2. realize the importance of ecofriendly fertilizers and pesticides.
3. demonstrate skills on culture and mass production of biofertilizers and biopesticides.
4. study the efficacy of biofertilizers and biopesticides in organic farming.

**Reference Books:**

1. Burges Horace D., 2012. Formulation of microbial biopesticides: beneficial microorganisms, nematodes and seed treatments. Springer Science & Business Media.
2. Khater Hanem Fathy 2012. "Prospects of botanical biopesticides in insect pest management." Pharmacologia 3, no. 12: 641-656.
3. Saleem F. and Shakoori A.R., 2012. Development of Bio insecticide. Lambert Academic Publishing, Latvia, European Union.
4. Mahendra K. R., 2005. Hand book of Microbial biofertilizers. The Haworth Press, Inc. New York.
5. Board N. I. I. R. 2004. The complete technology book on bio fertilizer and organic farming. National Institute of Industrial Re.
6. Kannaiyan S., 2003. Biotechnology of Biofertilizers. CHIPS, Texas.
7. Reddy S.M., 2002. Bio inoculants for sustainable agriculture and forestry. Scientific Publishers, Jodhpur.
8. Subba Rao N.S., 1995. Soil microorganisms and plant growth. Oxford and IBH publishing co. Pvt. Ltd. New Delhi.

## Plant Protection (Major)

### Course IV (BBPT 122) Principles of Organic Farming

#### Course Objectives:

#### The students should be able to...

1. understand the basic knowledge about organic farming.
2. acquire the knowledge of land and water management for organic farming
3. impart the knowledge about factors responsible for land degradation
4. explain the knowledge about importance of biofertilizers.

Credits(2)	Theory Course IV(BBPT 122 )	No. of hours per unit/ credits
	<b>Introduction to Organic Farming</b>	<b>(8)</b>
	<b>Unit I</b> <b>Organic Farming:</b> 1.1 Definition, concept, principles, Need of organic farming and its Scope in India. 1.2 Advantages and disadvantages of organic farming 1.3Types of organic farming, Benefits and limitations of organic farming. 1.4 Initiatives taken by the central and state governments, NGOs and other organizations for promotion of organic agriculture in India.	
	<b>Fundamentals of organic farming</b>	<b>(7)</b>
	<b>Unit II</b> 2.1 Fundamental organic farm management. 2.2 Land management in organic farming. 2.3 Water management in organic farming.	

<b>UNIT III</b>	<b>Management of Waste Land and Problematic soil</b>	<b>(8)</b>
	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 Acid Soils-Occurrence, formation, diagnosis, characteristics and management. 3.4 Waterlogged soils-Occurrence, characteristics and management. 3.5 Eroded soils: Occurrence characteristics and management.	
<b>UNIT IV</b>	<b>Biofertilizers</b>	<b>(8)</b>
	3.1 Introduction, types, importance ,History of biofertilizers production, advantages of biofertilizers. 3.2 Sources of biofertilizers –Bacteria, Cyanobacteria , Mycorrhiza, Methods of Composting 3.3 Vermicomposting, green manuring; types, advantages and Dis-advantages and nutrient availability. 3.4 Preparation of FYM, composts , different methods of composting, decomposition process	

### Course Outcomes:

#### The students will be able to...

1. describe the benefits and types of organic farming.
2. explain importance of land management in organic farming.
3. realize the importance of soil for organic farming .
4. apply the knowledge about preparation of biofertilizers .

### Reference Books:

- 1) Gopal Chandra De., 1980. “Fundamentals of Agronomy”. Oxford and IBH Publishing Co. Ltd., Bangalore.
- 2) Panda S., 2006. “Agronomy”. Agribios Publication, New Delhi.
- 3) Reddy S., 2011. “Principles of Agronomy”. Kalyani Publishers, Ludhiana, India.
- 4) Sankaran S. and Subbiah M., 1991. “Principles of Agronomy”. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
- 5) Rao V., 2006. “Principles of Weed Science”. Oxford and IBH Publishing Co., New Delhi, India.

- 6) Lockeretz William, ed., 2007. Organic farming: an international history. CABI.
- 7) Young, Anthony 1997. Agroforestry for soil management. No. Ed. 2. CAB international.
- 8) Brown Kirk W., Gordon B.E., and Beth D. F., 1983. "Hazardous waste land treatment."

**Plant Protection (Major)**

**Semester: II**

**Practical Course II (BBPP 123)**

**Course Objectives:**

**The students should be able to...**

1. imparts knowledge about production of bio-fertilizers.
2. familiarize with of preparation methods for vermi composting, vermiwash, Biofertilizers.
3. understand the knowledge identification of biological control agent.
4. apply the preparation method of biopesticide.

<b>Credits (2)</b>	<b>Practical Course II (BBPP 123 ) Practicals based on Theory Course III and IV</b>	<b>No. of hours per unit/credits 60 Hrs.</b>
<b>Credit II</b>	<ol style="list-style-type: none"><li>1. Study of equipment for production of bio-fertilizers.</li><li>2. Study of Isolation and culture techniques of 3 types of biofertilizers as per the theory syllabus.</li><li>3. Study of Characteristics, isolation and identification of Rhizobium, Azatobacter and Azospirillum.</li><li>4. Study of VAM-isolation and inoculum production.</li><li>5. Study of Identification of biological control agents.</li><li>6. Study of Isolation and culture of <i>Trichoderma</i>, <i>Pseudomonas</i> and <i>Fusarium species</i>.</li><li>7. Study of Isolation and culture of <i>Bacillus thuringiensis</i>, <i>Methizium</i>, <i>Beauvaria basina</i>.</li><li>8. Study of Demonstration of application equipment's for biopesticides.</li><li>9. Study of Calculations of dosage and application technique of biopesticides.</li><li>10. Study of different types of biofertilizers as per theory syllabus.</li><li>11-12. Study of preparation methods for vermicomposting, vermiwash.</li><li>13. Study of preparation methods for Enriched compost.</li><li>14. Study of biological control agents and their characteristics.</li><li>15. Preparation of botanical / fungal pesticides.</li></ol>	

**Course outcomes:****The students will be able to...**

1. acquire the knowledge about equipment's and production, quality of various biofertilizers.
2. understand the knowledge about preparation of enriched compost and botanical pesticides.
3. discuss about the inoculation and isolation of VAM.
4. apply the equipment's for preparation of biopesticides .

**Reference Books:**

1. Burges, Horace Denis 2012. Formulation of microbial biopesticides: beneficial microorganisms, nematodes and seed treatments. Springer Science & Business Media.
2. Saleem F., and Shakoori A., 2012. "Development of Bio insecticide". Lambert Academic Publishing, Latvia, European Union.
3. Reddy S., 2011. "Principles of Agronomy". Kalyani Publishers, Ludhiana, India.
4. Panda S., 2006 "Agronomy". Agribios Publication, New Delhi.
5. Rao V., 2006. "Principles of Weed Science". Oxford and IBH Publishing Co., New Delhi, India.
6. Reddy S., 2002. "Bio inoculants for sustainable agriculture and forestry". Scientific Publishers, Jodhpur.
7. Rai, Mahendra, ed. 2006. Handbook of microbial biofertilizers. CRC Press.
8. Subba Rao N., 1995. "Soil microorganisms and plant growth". Oxford and IBH publishing co. Pvt. Ltd. New Delhi.



## Plant Protection (Minor)

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### Semester: II Theory Course III (BBPT 124) Economically Beneficial Insects

#### Course Objectives:

#### The students should 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 control.

Credits (2)	Theory Course III (BBPT 124 )	No. of hours per unit/ credits
<b>Unit I</b>	<b>Introduction to Entomology</b>	<b>(8)</b>
	1.1 Introduction and history of entomology in India including contribution of scientists in brief. 1.2 Definitions: Insect, Entomology and agro-entomology 1.3 Economic importance of insects: Harmful, beneficial and productive insects. 1.4 Body segmentation: Structure of head, thorax and abdomen.	
<b>Unit II</b>	<b>Importance of beneficial insects in Agriculture</b>	<b>(7)</b>
	2.1 Importance of beneficial insects in Agriculture, Honeybee, Silkworm, Lac insects, Bio agents as natural enemies. 2.2 Various Institutes related to beneficial insects.	
<b>Unit III</b>	<b>Apiculture</b>	<b>(7)</b>
	3.1 Apiculture: Introduction and history of Beekeeping Bee keeping, morphology and anatomy, bee biology, Pollinating plants and their cycle, bee conservation 3.2 Commercial methods of bee rearing, equipment's used, seasonal management of bees.	

<b>Unit IV</b>	<b>Biocontrol agents (Natural Enemies)</b>	<b>(8)</b>
	4.1 Biocontrol agents (Natural Enemies): Introduction of bioagents, Ideal characteristics of bioagents, Successful examples of biological control 4.2 Major parasitoids: <i>Trichogramma</i> sp., <i>Chelonus blackburni</i> 4.3 Major predators: <i>Chrysoperla</i> sp., Lady bird beetle <i>Cryptolaemus montrouzieri</i>	

**Course Outcomes:**

**The students will 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.

**Reference Books:**

1. Dhaliwal G.S., 2015. Element of Agricultural Entomology. Published by Kalyani Publishers, New Delhi (ISBN: 978-93-272-5134-0).
2. Conrad Ross, 2013. Natural beekeeping: organic approaches to modern apiculture. Chelsea Green Publishing.
3. Butt, Tariq M., Chris Jackson, and Naresh Magan, 2001. Fungi as biocontrol agents: progress, problems and potential. CABI publishing.
4. Srivastava K. P. and Dhaliwal G. S. A text book of Applied Entomology, Vol. II, Kalyani Publisher.
5. David B. V., and Rammurthy V. V., Elements of Economic Entomology Namrutha Publications (7<sup>th</sup> Edition).
6. Ragumoorthy K. N., Srinivasan M. R., Balasubramani V., and Natarajan N. A. E. Principles of Applied Entomology. Publication, Coimbatore.
7. Tembhare D. B., Modern Entomology. Himalaya Publishing House (ISBN : 978-93-5051-828-1).
8. Dhaliwal G. S., Ram Singh and Chillar B. S. Essentials of Agricultural Entomology. Kalyani Publisher.

**Plant Protection (Minor)**

**Course IV (BBPT 125)**

**Seed Pathology**

**Course Objectives:**

**The students should be able to...**

1. understand the basic knowledge about seed pathology.
2. discuss about the effect of pathogens on seed-borne disease development.
3. impart knowledge about principles of seed-borne disease management.
4. know about seed germination and seed viability

<b>Credits(2)</b>	<b>Theory Course IV (BBPT 125 )</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Introduction to Seed Pathology</b>	<b>(7)</b>
	1.1 Introduction, History, Objectives, the Importance of seed pathology. 1.2 Structure of monocot and dicot seeds, seed-borne diseases, importance, and seed pathology concepts. 1.3 Losses Caused by seed-borne diseases.	
<b>UNIT II</b>	<b>Seed Testing</b>	<b>(8)</b>
	2.1 Seed quality: Concept, the role of high-quality seeds in increasing crop production, seed quality control, characteristics of sowing quality seeds. 2.2 Germination testing: Concept, objectives, requirement, procedure, and Methods of seedling evaluation. 2.3. Seed viability: Principle, objectives, and methods of TZ test, embryo excision test.	
<b>UNIT III</b>	<b>Seed Infection and Management</b>	<b>(7)</b>
	3.1 Concept and significance of infection, morphology, and anatomy of seed, entry points of seed infection. 3.2 The importance of transmission of disease through seeds, and their impact on agriculture. 3.3 Transmission of diseases from plants to seeds: Development of diseases from plants to seeds.	

	<b>Seed Treatment</b>	
<b>UNIT IV</b>	4.1 Traditional Methods to control seed-borne pathogens during storage.	<b>(8)</b>
	4.2 Chemical method of seed treatment: Dust, Slurry method by using various equipment.	
	4.3 Impact of storage fungi on stored grains seeds.	

**Course Outcomes:**

**The students will be able to...**

1. understand the quality as well as the genetic purity of seeds.
2. apply the methods for checking seed germination and seed viability of seed.
3. discuss about the morphological and anatomical changes in seeds by pathogens.
4. demonstrate the traditional and modern methods of seed-borne disease management.

**Reference Books:**

1. Agrawal 2018. Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
2. Joshi A.K., and Singh B.D., 2017. Seed Science and Technology; Edition. Revised; Publisher. Kalyani Publishers.
3. Hutchins J.D., and Reeves J.E., (Eds.). 1997. Seed Health Testing: Progress Towards the 21<sup>st</sup> Century. CABI, Wallington.
4. Kigel Jaime, 1995. Seed development and germination. Vol. 41. CRC press.
5. Agarwal V.K., and Sinclair J.B., 1993. Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi.
6. Agarwal R.N., 1982. Seed Technology. Author, R. L. Agrawal; Publisher, Oxford, and IBH Publishing.
7. Paul Neergaard., 1988. Seed Pathology. MacMillan, London.
8. Suryanarayana D., 1978. Seed Pathology. Vikash Publ., New Delhi.

## Plant Protection (Minor)

### Practical Course II (BBPP 126)

**Course Outcomes:**

**The students will be able to...**

1. understand the knowledge about economically important insects.
2. learn about preservation methods of insect and seed borne pathogens.
3. acquire the knowledge about different methods used for seed germination and seed viability.
4. Identify and classify seed borne pathogens.

Credits (2)	Practical Course II ( BBPP 126 ) Practicals based on Course III and IV	No. of hours per unit/ credits 60 Hrs.
<b>Credit II</b>	<ol style="list-style-type: none"> <li>1. Study of external features of typical insect (e.g. Cockroach) structure of head, thorax and abdomen/General body organization of insect.</li> <li>2. Study of Methods of collection and preservation of insects including immature stages</li> <li>3. Study of Types of larva and pupa.</li> <li>4-5 .Study of beneficial insects in Agriculture, Honeybee, Silkworm, Lac insects</li> <li>6. Study of common Predators and Parasitoids</li> <li>7. Study of Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease.</li> <li>8.Visit to research and training institutions devoted to beekeeping, lac culture and natural enemies</li> <li>9.Study of the structure of monocot and dicot seeds.</li> <li>10.Study of Germination testing by the Course method.</li> <li>11.Study of Seed viability test by TTC method.</li> <li>12. Study of seed-borne pathogens (Any five).</li> <li>13.Study of Microscopic examination of dry seeds for disease symptoms. (Any five).</li> <li>14. Study of seed treatment by hand rotary duster.</li> <li>15. Study of Peroxidase and GA tests of any seeds.</li> <li>16.Visit to seed testing laboratory.</li> </ol>	

**Course Outcomes:**

**The students will be able to...**

1. know about economically importance of apiculture.
2. identify the types of seed, seed diseases and seed health.
3. update the knowledge about Honey bee species and castes .
4. identify the seed borne pathogens

**Reference Books:**

1. Joshi A., and Singh B., 2017. "Seed Science and Technology". Revised Edition. Kalyani Publishers, New Delhi.
2. Dhaliwal G., 2015. "Elements of Agricultural Entomology". ISBN: 978-93-272-5134-0). Kalyani Publishers, New Delhi.
3. Dhaliwal G., Ram Singh and Chillar B., 2011. "Essentials of Agricultural Entomology". Kalyani Publisher, New Delhi.
4. Tembhare D., 2008. "Modern Entomology". (2<sup>nd</sup> Edn.,) ISBN: 978-93-5051-828-1) Himalaya Publishing House, New Delhi.
5. Basra A.S., 2007. Handbook of seed science and technology. Scientific Publishers.
6. Paul N., 1988. "Seed Pathology". MacMillan, London.
7. Agarwal R., 1982 "Seed Technology". Oxford, and IBH Publishing.
8. Suryanarayana D., 1978. "Seed Pathology". Vikash Publ., New Delhi.

**Plant Protection (Open Elective)**

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**Theory Course III (BBPT 127)  
Organic Farming III**

**Course Objectives:**

**The students should be able to...**

1. understand the basic knowledge of ecology of weeds.
2. apply the methods for integrated weed management.
3. update the knowledge about the certification of organic farm products.
4. impart the knowledge about weed biology.

<b>Credits-2</b>	<b>Theory Course II (BBPT 127)</b>	<b>No. of hours per unit/ credits</b>
<b>Unit I</b>	<b>Weed Biology and Ecology Weeds:</b>	<b>(7)</b>
	1.1 Weed - Introduction, types of weed, harmful and beneficial effects, 1.2 Critical periods of crop weed competition and allelopathy. 1.3 Propagation, dissemination and weed seed dormancy 1.4 Weed biology and ecology	
<b>UNIT II</b>	<b>Traditional methods of weed management</b>	<b>(8)</b>
	2.1 Weed management principles and methods/options – preventive, physical, cultural, biological. 2.2 IWM ( Integrated Weed Management)	
<b>UNIT III</b>	<b>Organic Methods of Weed Management</b>	<b>(7)</b>
	3.1 Thermal Weed Control. 3.2 Soil Solarization and mulching. 3.3 Mechanical Weed Management 3.4 Stale Seedbed. 3.5 Crop Rotation.	
<b>UNIT IV</b>	<b>Certification of organic farming Products</b>	<b>(8)</b>
	4.1 Organic certification Standards and regulations 4.2 Operational Structure of NPOP – other agencies for organic production 4.3 Inspection, Certification, Labelling and accreditations procedures for organic products	

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

1. recognize the knowledge about weeds and its potential negative impact in a farm.
2. learn about traditional weed management practices.
3. update the knowledge about the importance of certification of organic farming products.
4. design a farm friendly methods of weed management.

**Reference Books:**

1. Agrawal 2018. Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
2. Joshi A.K., and Singh B.D. 2017. Seed Science and Technology; Edition. Revised; Publisher. Kalyani Publishers.
3. Basra A. S., ed. 2007. Handbook of seed science and technology. Scientific Publishers.
4. Hutchins J.D., and Reeves J.E. (Eds.). 1997. Seed Health Testing: Progress Towards the 21<sup>st</sup> Century. CABI, Wallington.
5. Agarwal V.K., and Sinclair J.B., 1993. Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi.
6. Paul N. 1988. Seed Pathology. MacMillan, London.
7. Agarwal R.N., 1982. Seed Technology; Author, R. L. Agrawal; Publisher, Oxford, and IBH Publishing.
8. Suryanarayana D., 1978. Seed Pathology. Vikash Publ., New Delhi.



**Theory Course IV (BBPT 128)**  
**Organic Farming IV: Biofertilizers and Biopesticides**

**Course objectives:**

**The students should be able to...**

1. explain the basic knowledge about importance of biofertilizers.
2. understand the knowledge culture of bacteria and fungi.
3. acquire the knowledge about botanical and bacterial biopesticides.
4. apply the knowledge about preparation vermicomposting in field .

Credits (2)	Theory Course IV (BBPT 128 )	No. of hours per unit/ credits
Unit I	<b>Basics of Biofertilizers</b>	(7)
	1.1 <b>Biofertilizers</b> – definition, importance and advantages. 1.2. <b>Sources of Biofertilizers</b> -Bacteria, Cyanobacteria, Mycorrhiza and PSM. 1.3. <b>Outlines of production technology of biofertilizers</b> -isolation, selection of strain, preparation of mother culture, starter culture, mass culturing.	
Unit II	<b>Culture of Bacterial and fungal Biofertilizers</b>	(8)
	2.1 <b>Rhizobium</b> –Mass multiplication, starter culture, mass cultivation, inoculant formulations and application method. 2.2 <b>Azotobacter</b> - Mass multiplication, maintenance of culture, application and crop response. 2.3 <b>Anabaena</b> - Characteristics, <i>Azolla</i> Anabaena association, <i>Azolla</i> production and application. 2.4 <b>VAM</b> -mass production-substrate, substrate free, in-vitro methods and crop response I	
UNIT III	<b>Botanical and fungal Biopesticides</b>	(7)
	3.1 <b>Biological control agents and their characteristics.</b> 3.2 <b>Types of biopesticides:</b> Bacterial, fungal and viral; advantages and disadvantages. 3.3 <b>Properties of botanical biopesticides:</b> Pesticide products <i>Azadirachta</i> , <i>Pongamia</i> and <i>Annona</i> . 3.4 <b>Characteristics of biological fungicides:</b> <i>Trichoderma</i> , <i>Pseudomonas</i> and <i>Fusarium</i> species; production and processing of biological fungicides.	
UNIT IV	<b>Biofertilizers</b>	(8)
	4.1 <b>Introduction</b> , types, importance, History of biofertilizers production, advantages of biofertilizers	

	<p>4.2 <b>Sources of biofertilizers</b> –Bacteria, Cyanobacteria, Mycorrhiza</p> <p>4.3 <b>Manures</b> – Compost, Methods of Composting</p> <p>4.4 <b>Vermicomposting, green manuring</b>; types, advantages and disadvantages and nutrient availability.</p> <p>4.5 <b>Preparation</b> of FYM, composts, different methods of composting, decomposition process</p>	
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**Course Outcomes: The students will be able to...**

1. discuss about the need and importance of biofertilizers
2. explain importance of VAM
3. realize the importance of botanical biopesticides
4. demonstrate the preparation method of vermicomposting and FYM.

**Reference Books:**

1. Ortiz A., and Estibaliz S., 2022. "The role of beneficial microorganisms in soil quality and plant health." *Sustainability* 14, no. 9 : 5358.
2. Abbey L., Joel A., Adedayo L.A., Ekene Mark-A.I., and Mercy I., 2019. "Biopesticides and biofertilizers: types, production, benefits, and utilization." *Byproducts from Agriculture and Fisheries: Adding Value for Food, Feed, Pharma, and Fuels*: 479-500.
3. Kumar V.V., 2018. "Biofertilizers and biopesticides in sustainable agriculture." *Role of Rhizospheric Microbes in Soil: Volume 1: Stress Management and Agricultural Sustainability* : 377-398.
4. Saleem F. and Shakoori A.R., 2012. *Development of Bio insecticide*, Lambert Academic Publishing, Latvia, European Union.
5. Mahendra K. R., 2005. *Hand book of Microbial biofertilizers*. The Haworth Press, Inc. New York.
6. Kannaiyan S., 2003. *Biotechnology of Biofertilizers*. CHIPS, Texas.
7. Reddy S.M., 2002. *Bioinoculants for sustainable agriculture and forestry*. Scientific Publishers, Jodhpur.
8. Subba Rao N.S., 1995. *Soil microorganisms and plant growth* Oxford and IBH publishing co. Pvt. Ltd. New Delhi.

## Plant Protection (Open Elective)

### Practical Course II (BBPP 129)

#### Course Objectives:

##### The students should be able to...

1. imparts knowledge about Weeds and their management.
2. learn about preparation methods for vermicomposting, vermiwash, and Biofertilizers.
3. apply the knowledge about cultivation and use of green manures in field.
4. understand the knowledge about mass multiplication of bacteria and fungi.

Credits (02)	Practical Course -II (BBPP 129)  Practicals based on Theory Course III and IV	No. of hours per unit/ credits 60 Hrs.
Credit II	1. Various types of Weeds (Classification based on ecological condition) 2. Study of propagation, dissemination and weed seed dormancy 3. Study of Organic Methods of Weed Management ( Cultural, Mechanical, Biological) 4. Study of Cultivation of Sun hemp and Daincha helps to control the nut grass ( <i>Cyperus</i> ) Weed. 5. Study of different types of mulches 6. Study of Procedure for Certification of organic farming Products 7. Study of different types of biofertilizers as per theory syllabus. 8. Study of preparation methods for vermicomposting and vermiwash 9-10. Study of preparation methods for Enriched compost. 11- 12. Study of Bio -fertilizers and Bio -inoculants .as per syllabus 13-14. Study of mass multiplication of bacteria and fungi as per syllabus.	

#### Course Outcomes:

##### The students will be able to...

1. identify and classify the weeds.
2. update the knowledge preparation methods for vermicomposting, vermi -wash, and Biofertilizers.
3. apply the methods used for mass multiplication of bacteria and fungi.
4. know the procedure for certification of organic farming products.

## Reference Books:

1. Awan D.A., Mushtaq A.S., Muhammad S.N, and Shakoori A.R., 2012. "Toxicological and biochemical studies on spinosad and synergism with piperonyl butoxide in susceptible and resistant strains of *Tribolium castaneum*." Pak. J. Zool 44: 649-662.
2. Rai M., ed. 2006. Handbook of microbial biofertilizers. CRC Press.
3. Rai MK., 2006 "Microbial biofertilizers." Haworth press, Inc 10: 13904-1580.
4. Banerjee M.R., Laila Y., Joseph K.V., and M. Rai M., 2006. "Plant-growth-promoting rhizobacteria as biofertilizers and biopesticides." Handbook of microbial biofertilizers. Food Products Press, New York: 137-181.
5. Board N.I.I.R. 2004. The complete technology book on bio-fertilizer and organic farming. National Institute of Industrial Re.
6. Kannaiyan S., 2002. "Biotechnology of biofertilizers." Springer Science & Business Media.
7. Reddy S.M., 2002 "Bioinoculants for sustainable agriculture and forestry." Scientific Publishers, Jodhpur.
8. Subba Rao N.S. 1995. "Soil microorganisms and plant growth". Oxford and IBH publishing co. Pvt. Ltd. New Delhi.

**Plant Protection (SEC)**  
**(Skill Enhancement Course)**

**Semester: II**  
**Course I (SEC 103)**

**Sustainable Agricultural Practices**

**Course objectives: The students should be able to...**

1. understand the basic knowledge about sustainable agriculture.
2. update the knowledge of concept and components of organic farming and management of natural resources.
3. acquire the knowledge about sustainability of agricultural resources.
4. apply the preparation methods for vermicomposting agricultural waste management.

Credits (2)	Theory Course -I (SEC 103 ) Sustainable Agricultural Practices	No. of hours per unit/ credits
<b>Unit I</b>	<b>Introduction to Sustainable Agriculture</b>	<b>(8)</b>
	1.1 Sustainable agriculture: introduction, definition, concept, goals, elements, adverse effects of modern agriculture, current status of sustainable agriculture in India. 1.2 Factors affecting ecological balance and sustainability of agricultural resources: soil degradation, deforestation, accelerated soil erosion, siltation of reservoirs etc.	
<b>UNIT II</b>	<b>Organic Farming tool for sustainable agriculture management of natural resources</b>	<b>(7)</b>
	2.1 Organic farming: definition, principles, relevance to modern agriculture and components of organic farming, integrated nutrient management. 2.1 Management of natural resources.	
<b>Credit II</b>	<b>Practical's</b>	<b>(30)</b>
	1 Application and result of farm yard manure in soil. 2 Study of degraded land. 3 Preparation of Vermi-compost. 4 Application and result of Vermi-compost in soil. 5 Utilization of agri cultural waste.	

	<p>6 Visit to nearby organic farm to know various components of organic farming.</p> <p>7 Preparation of enriched farm yard manure</p>	
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**Course Outcomes:**

**The students will be able to...**

1. explain the basic concepts of sustainable agriculture
2. understand concept of organic farming for sustainable development.
3. discuss about the knowledge of management of natural resources.
4. learn about preparation methods for vermicomposting agricultural waste management.

**Reference Books:**

1. Dahama A.K., 2007. Organic Farming for Sustainable Agriculture. Agrobios (India), Jodhpur.
2. Sharma A.K., 2006. A Hand Book of Organic Farming. Agrobios (India), Jodhpur.
3. Purohit S.S., 2006. Trends in Organic Farming in India. Agrobios (India), Jodhpur.
4. Raman S., 2006. Agricultural Sustainability – Principles, Processes and Prospects. Food Products Press, New York.
5. Subramaniam S., 2004. Globalization of Sustainable Agriculture. Kalyani Publishers, Ludhiana.
6. Deb D.L., 1994. Natural Resources Management for Sustainable Agriculture and Environment. Angkor publishers Ltd., New Delhi.
7. Thampan P.K., 1993. Organics in Soil Health and Crop Production. Peekay Tree Crops Development Foundation, Cochin.
8. Dalela R.C., and Mani U.H., 1985. Assessment of Environmental Pollution. Academy of Environmental Biology, Muzaffarnagar.
9. Ruthenburg H. 1971. Farming Systems in Tropics. Clarendon Press, London.

Karmaveer Bhaurao Patil University, Satara  
**Yashwantrao Chavan Institute of Science, Satara**  
**Syllabus to be introduced from June 2023**  
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**(Value Education Courses)**

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**Semester II**

**Digital Technology**