

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

A Lead College of Karmaveer Bhaurao Patil University, Satara

Syllabus to be introduced from June 2024

Bachelor of Science (B. Sc.) Part – II

Plant Protection (Major)

As per NEP 2020 w. e. f. 2024-25

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Plant Protection (Major)

1. TITLE: **Plant Protection**

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

3. PREAMBLE:

The B. Sc. Plant Protection course under autonomy will be effective from the academic year 2024 - 2025. 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 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 and botany to become entrepreneurs, and enable students to get employed in plant-based industries like Seed agrochemical industries.

i. THIRD SEMESTER

Sr. No.	Subject Title	Theory				Practical		
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits	Course code	No. of lectures Per week	Credits
1.	Plant Protection (Major)	Course – I BBPT	Plant Pathology	4	4	Practical Course - I -BBPT	8	4
		Course - II BBPT	Major Crops, Methods of Integrated Plant Protection					
2.	Plant Protection (Minor)	Course – I -BBPT	Plant Health Management	2	2	Practical Course - I -BBPT	4	2
3.	Vocational Skill Course (VSC)	Course – I -	Biofertilizer Production -	-	-	Practical Course - I	4	2
4.	Skill Enhancement Course (SEC)	Course – I	Sustainable Agricultural Practices -	-	-	Practical Course - I BBPT	4	2
5.	Value Education Course (VEC)	Course – I VEC	Environmental Studies in Plant Protection	2	2	--	--	--

ii. FOURTH SEMESTER

Sr. No.	Subject Title	Theory				Practical		
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits	Course code	No. of lectures Per week	Credits
1.	Plant Protection (Major)	Course – III-BBPT	Insect Pests and their Management	4	4	Practical Course - II-BBPP	8	4
		Course – IV-BBPT	Weeds and Their Management					
2.	Plant Protection (Minor)	Course – III-BBPT	Weed Management in Horticultural Crops	2	2	Practical Course - II-BBPP	4	2
3.	Vocational Skill Course (VSC)	Course – III VSC Course – IV	Post Harvest Management	-	-	Practical Course - II-	4	2
4.	Skill Enhancement Course (SEC)	Course - I SEC	Soil and Water Management	-	-	Practical Course -	4	2
5	Cocurricular Course (CC)	CC		2	2	--	--	--

4. Structure and titles of Courses of B. Sc. Course

B. Sc. II Semester III

Plant Protection (Major)

Course I BBPT: Plant Pathology

Course II BBPT: Major Crops, Methods of Integrated Plant Protection

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

Plant Protection (Minor)

Course I BBPT: Plant Health Management

Practical Course BBPP: Practical based on Theory Course I

Vocational Skill Course (VSC)

Course I: Biofertilizer Production

Practical Course: Practical based on Theory Courses I

Skill Enhancement Course (SEC)

Course I BBPT: Sustainable Agricultural Practices

Practical Course BBPP: Practical based on Theory Course I

Value Education Course (VEC)

Course I VEC: Environmental Studies in Plant Protection

English Course: AEC

B. Sc. II Semester IV

Plant Protection (Major)

Course VII BBPT: Insect Pests and their Management

Course VIII BBPT: Weeds and their Management

Practical IX BBPP: Practicals based on Theory Courses VII.. and VIII

Plant Protection (Minor)

Course III BBPT: Weed Management in Horticultural Crops

Practical II BBPP: Practical based on Theory Courses

Vocational Skill Course (VSC)

Course: Post Harvest Management

Practical II: Practicals Based on Theory Courses

SEC (Skill Enhancement Course)

Course I SEC : Soil and Water Management

CC (Cocurricular Course) CC

SEMESTER - III

Plant Protection (Major)

Semester-III

Course I (BBPT

Plant Pathology

Course objectives: The Students will be able to

1. understand the basic knowledge about Crop diseases.
2. imbibe the knowledge of the mechanism of plant infection.
3. impart the knowledge about the agricultural crop diseases.
4. acquire the knowledge about management of crop diseases and pathophysiological and skills.

Credits (2)	Theory Paper I (BBPT 301) Plant Pathology	No. of hours (30)
Unit-I	Concept of Plant diseases	(08)
	1.1. Definition and concept of disease. 1.2. Terminologies in Plant Pathology: Host, pathogen, pathogenicity, pathogenesis, symptoms, infection, inoculum, incubation period, Etiology, susceptibility, immunity, hypersensitivity, resistance, Disease Cycle, hypertrophy, and hyperplasia. 1.3. Classification of plant diseases: Based on a) Pathogens, b) Symptoms, c) Severity of disease; sporadic, epidemic, and epiphytotic, d) Transmission of pathogens through seed, soil, air, and insects. 1.4 Types of culture media & Sterilization methods. 1.5 Methods of studying plant pathogens: Koch's Postulates.	
	Mechanism of Penetration and Plant Infection	(07)
UNIT II	2.1 Mechanism of Penetration and Infection. 2.2 Mode of infection and Factors affecting infection	

UNIT III	Study of selected plant diseases w.r.t symptoms, causal organisms and disease management.	(08)
	3.1 Little leaf of Brinjal 3.2 Yellow vein mosaic of Okra (Bhendi) 3.3 Citrus canker 3.4 Powdery mildew of Gerbera 3.5 Rust of soybean 3.6 White Rust of Crucifers 3.7 Brown rust of Wheat 3.8 Grain smut of Jowar 3.9 Tikka disease of Groundnut	
UNIT IV	Management of crop diseases	(07)
	4.1 Mechanical method: Eradication 4.2 Chemical method: Classification of fungicides based on chemical nature and mode of action; Study of properties, formulation, mode of action and uses of Carbendazim and Benomyl 4.3 Cultural technique 4.4 Biological method of disease management.	

Course Outcomes: The students will be able to

1. describe the basic concepts of plant protection, and explain basic terminologies used in plant protection.
2. explain the mechanism of plant infection and the mode of infection of plant diseases.
3. describe the factors affecting infection, and explain the agricultural crop diseases.
4. explain the Management of crop diseases, and describe the pathophysiological skills.

References:

1. Bilgrami KS, Textbook of Modern Plant Pathology, New edition, New Delhi (1990).
2. Aneja KR, Experiments in Microbiology Plant Pathology and Tissue Culture, New Age International (P) Ltd. Publishers, New Delhi (2005).
3. Mehrotra RS and Aggarwal A, Fundamentals of Plant Pathology, McGraw-Hill Education Pvt. Ltd., New Delhi (1980).
4. Jain VK, Laboratory Manual of Plant Pathology, Oxford Book, Calcutta (2009)

5. Agrios G.N, Plant Pathology, (5th Edn.), Academic Press, San Diego (2005)
6. Butler & Edwin, Plant Pathology, , Macmillan & Co. (1949).
7. Chattopadhyay SB, Principles and procedures of plant protection, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (1987).
8. Baruah HK, Text Book of Plant Pathology, Oxford and IBH Publ. Co., New Delhi (1984).

Plant Protection (Major)

Semester-III

Course II (BBPT

Major Crops, Methods of Integrated Plant Protection

Course Objectives: The students should be able to

1. understand the concept and importance of plant protection
2. study the gross morphology and the Agronomy of Agricultural Crops.
3. gain the knowledge about different methods of Plant Protection.
4. impart knowledge about the advanced methods of Plant Protection.

Credits(2)	Theory Course II (BBP ...)	No. of hours (30)
Unit I	Introduction of plant protection and study of crops	(7)
	1.1. Introduction and importance of Plant Protection; Study of Agronomical practices about the following crops : 1.2. Cereal Crops – Jowar, 1.3. Oil seed crop– Groundnut, 1.4. Pulse Crop – Gram, 1.5. Cash crop – Sugarcane	
UNIT II	Study of Horticultural Crops	(8)
	2.1 Study of agronomical practices about the following crops: 2.2 Fruit crops – Mango, 2.3 Vegetable crops –Brinjal, 2.4 Spices –Chilli, 2.5 Floriculture – Marigold;Eco-friendly Agricultural practices: Green manuring 2.6 Biofertilizers and their types.	
UNIT III	Methods of plant Disease management	(8)

	<p>IDM – Integrated Disease Management:</p> <p>3.1 Cultural methods –Tillage, crop rotation, trap crops, fertilizer applications;</p> <p>3.2 Mechanical methods – Field sanitization, Hand picking</p> <p>3.3 Physical methods – Heat and soil solarization</p> <p>3.4 Chemical methods –Brief account and uses of Bactericides, Fungicides, Insecticides, Nematicides, Acaricides, Molluscicides, and Rodenticides</p>	
UNIT IV	Management of crop diseases	(7)
	<p>4.1 Biological methods –Biological control of Insect pests and crop diseases</p> <p>4.2 Legal methods – Plant quarantine in India</p> <p>4.3 Crop resistance – Uses of resistant varieties and their examples.</p>	

Course Outcomes: The students will be able to

1. describe the concept and importance of plant protection.
2. get knowledge about gross morphology and agronomy of floricultural crops and fruit crops
3. apply knowledge of different methods of plant protection.
4. explain the development of crop resistance.

Reference:

1. Reddy S.R., 2011. Principles of Agronomy. Kalyani Publishers, Ludhiana, India.
2. Panda S.C., 2006. Agronomy. Agribios Publication, New Delhi.
3. Rao V.S., 2006. Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.
4. Denckla T., 2004. Gardener's A – Z to Growing Organic Food. Storey Books, England.
5. Tompkins P., and Bird C., 2004. Secrets of the Soil. Rupa Publisher Pvt Ltd., New Delhi.
6. Sankaran S., and V.T., Subbiah Mudliyar, 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

7. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.

Plant Protection (Major)

Practical Course -I &II(BBPP)

Course Objectives: The Students should be able to

1. familiarize the students with general plant pathological equipment and pathological procedures (Preparation of culture media, 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.

Credits (4)	Practical Course- I (BBPP) (Practicals based on Theory Courses I and II) Group A	No. of hours (120)
	<p>1-5.Study of the following diseases in crops concerning host, causal organism, symptoms, and management :</p> <ol style="list-style-type: none"> 1. Yellow vein mosaic of Okra (Bhendi), 2. Little leaf of Brinjal, Citrus canker, 3. Rust of Sugarcane, 4. White rust of Amaranthus / Crucifers, 5. Rust of Wheat, Rust of Soybean, 6. Grain smut of Jowar, 7. Tikka disease of Groundnut, 8. Powdery mildew of Gerbera <p>6-7. Sterilization and Preparation of PDA culture medium.</p> <p>8-9. Soil dilution technique- Serial Dilution, Isolation, Inoculation</p>	

	<p>and identification of soil fungi.</p> <p>10. Separation of amino acids from healthy and diseased plants using paper chromatography technique.</p> <p>11. Determination of sucrose percentage by Hand refractometer in Sugarcane and Grape.</p>	
	Group B	
	<p>12-17. Agronomic studies of the following crops with reference to gross morphology for crop identification and agronomic conditions- Cereal Crops – Jowar, Oil seed crop– Groundnut, Pulse Crop – Gram, Cash crop – Sugarcane. Fruit crops – Mango, Vegetable crops –Brinjal, Spices –Chilli, Floriculture – Marigold</p> <p>18-19.Eco-friendly agrobiochemicals: Green manuring: Sunhemp and Delchi; Biofertilizers: Azolla and Nostoc; Biopesticides: Azadirachtin and Pyrethrin.</p> <p>20. Tour report /Excursions/ Visits to Agricultural institutes/ Polyhouse.</p>	

Course Outcomes

The students will be able to :

1. identify diseases with symptoms and by nature of damage.
2. study of any plant pathogen by different techniques
3. apply agronomic conditions for crops.
4. determine amino acids by paper chromatography

Reference:

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". 7th Ed. Prentice Hall.
3. Agrios G., 2005. "Plant Pathology". (5thEdn.), 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". 13th 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.
9. Reddy S.R., 2011. Principles of Agronomy. Kalyani Publishers, Ludhiana, India.
10. Panda S.C., 2006. Agronomy. Agribios Publication, New Delhi.
11. Rao V.S., 2006. Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.
12. Denckla T., 2004. Gardener's A – Z to Growing Organic Food. Storey Books, England.
13. Tompkins P., and Bird C., 2004. Secrets of the Soil. Rupa Publisher Pvt Ltd., New Delhi.
14. Sankaran S., and V.T., Subbiah Mudliyar, 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
15. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.

Plant Protection (Minor)

Semester-III

Theory Course -I &II(BBPP)

Plant Health Management

Course objectives: The students should be able to

1. understand the basic knowledge about plant health management.
2. update the knowledge of agricultural crop management.
3. acquire the knowledge to develop need-based crop health management protocols.
4. develop communication regarding plant protection management.

Credit (2)	Theory Course (BPPT___) Plant Health Management	No. of hours (30)
UNIT I	Plant Health Care	(8)
	1.1. Introduction, Meaning of plant health, Scope and Importance. 1.2. Key determination of plant health Care. 1.3. Plant health care equipments, Products, Fertilizers, field station Visual. 1.4. Aids, and Plant health care Apps. 1.5. Plant health pyramid and Plant health diagnosis.	
UNIT II	Plant Nutrition management	(7)
	2.1 Plant nutrients, roles and deficiencies. 2.2 Nutrient Antagonism. 2.3 Tips for manitaning plant health. 2.4 Nutrient management.	
UNIT III	Soil Health Care & Sustainable Agriculture	(8)
	3.1 Soil profile: Concept and analysis. 3.2 Soil properties and status of soil health. 3.3 Types of soil, Soil nutrients and Plant health. 3.4 Soil health card: Concept, analysis and importance. 3.5 Rhizosphere dynamics for sustainable agriculture.	
UNIT IV	Measures of Plant Health Care	(7)
	4.1 Measuring key indicators for plant growth and productivity. 4.2 Insects an an indicator of plant health. 4.3 Ready reckoner for plant protection. 4.4 Plant disease diagnosis.	

Course Outcomes: The students will be able to

1. become a part of Human Resources for both in public and private sector, covering areas of plant protection technology and Plant Health Care Management.
2. become a field programs trainer to the common people.
3. provides documentation services regarding plant protection management.
4. understand the importance of plant health care.

Refernces needed here

Plant Protection (Minor)

Semester-III

Practical Course -I &II(BBPP)

Plant Health Management

Course objectives: The students should be able to

1. understand the basic knowledge about plant health management.
2. update the knowledge of agricultural crop management.
3. acquire the knowledge to develop need-based crop health management protocols.
4. to develop communication in regard of plant protection management.

Practicals Based on Plant Health Management

Credits (2)	Practical Course- I (BBPP.....) (Practical based on Theory Courses I Plant Health Management)	No. of hours (60)
	<ol style="list-style-type: none">1. Study of typical healthy plant.2. Study of plant heath care equipments and Products.3. Study of field station Visual Aids and Plant health care Apps4. Study of plant nutrition (Role and deficiencies)5. Study of plant disease diagnosis. (Any two)6. Study of biochemical analysis of crop plant with reference to Protein content.7. Study of amino acids form healthy and infected crop plants.8. Study of rhizosphere dynamics9. Study of physico-chemical properties of soil samples (Any two)10. Visit to Agricultural Institute/Soil Analysis laboratory/Plant analysis laboratory. <p>20 Practicals needed</p>	

Course Outcomes: The students will be able to

1. become a part of Human Resources for both in public and private sector, covering areas of plant protection technology and Plant Health Care Management.
2. become a field programs trainer to the common people.
3. provides documentation services in regard to plant protection management.
4. understand the importance of plant health care.

Reference:

1. Chand G. 2018. Plant Health Management, New India Publishing Agency- Nipa.
2. Jain V.K.. 2020. Fundamentals of Plant Physiology, S. Chand Publications.
3. Gupata V. K. 1996. Integrated Disease Management and Plant Health, Scientific Publishers Journals.
4. Sood B.S. 2002. Mineral Nutrition of Plants, Medtech Publishers.
5. S. Mohandas. 2005. Introduction to Soil Science. | Kalyani Publishers.
6. Sai Prasad S. V. 2007. Soil Science, New Vishal Publication.
7. Krishan K. Verma. 2008. Practical manual on fundamentals of plant physiology, Kalyani, Publishers.
8. Manju Bala. 2010. Practical in Plant Physiology and Biochemistry, Scientific publications.
9. Vijay Yadav. 2007. A Colour Handbook on Practical Plant Pathology, India Publishing Agency.
10. Laird Liz. 2019. Principles of Soil Science, Laxmi Publications; Fourth edition.
11. Practical Manual of Soil Science, Vijay Kumar, BRILLION Publishing.

Plant Protection

Semester-III

Biofertilizer Production (BBT-VSC-II)

Course Objective: The students will be able to

1. familiarize the students with soil fertility, types of fertilizers, etc.
2. imparts the knowledge about farm yard manures, methods of composting, etc.
3. understand the Knowledge about isolation of rhizobium, azosprillum, etc.
4. explain the knowledge about mass multiplication.

Credits (2)	Practical Course -I (BBPP.....) (Practicals based on Theory Courses I)	No. of hours (60)
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	<ol style="list-style-type: none"> 1. study of soil fertility Analysis. 2. Study of types of biofertilizers. 3. Study of preparation of farm yard manures. 4. Study of methods of composting. 5. Study of preparation of vermicompost, vermiculture, and vermiwash. 6. Study of preparation of jeevamrut as a biofertilizer. 7. Study of the preparation of Beejamrut for seed treatment. 8. Study of equipment used for the production of biofertilizers. 9. Study of isolation of rhizobium from root nodal. 10. Study of isolation of azosprillium from the plant. 11. Study of isolation of azotobactor from soil root. 12. Study of isolation and culture of bacillus thuringensis. 13. Study of mass production of VAM. 14. Study of isolation and inoculation of soil microorganisms by serial dilution method. 15. Study of mass multiplication of blue-green algae. 16. Study of isolation of blue-green algae from soil. 17. Study of mass multiplication of azolla. 18. Study of preparation of Dashaparni ark as a biopesticide. 19. Visit to industry 20. One more practical needed 	
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Course Outcomes: The Students will be able to

1. explain the types of biofertilizers used in the field.
2. discuss the importance of biofertilizers for increasing the production rate.
3. apply the knowledge of the production of biofertilizers
4. demonstrate the use of biofertilizers in the field.

Reference:

1. Raja N. (2013). Biopesticides and biofertilizers: eco-friendly sources for sustainable agriculture. J Biofertil Biopestici, vol.4 (1).
2. Soer 2015 — The European environment — state and outlook 2015

3. Megali L, Glauser G, Rasmann S. (2013). Fertilization with beneficial microorganisms decreases tomato defenses against insect pests. *Agron Sustain Dev*. doi:10.1007/s13593-013-0187-0.
4. Food and Agricultural Organization of the United Nations, Soil Bulletin 20,
5. H. Zulkifli, University Putra Malaysia, in Inaugural Lecture of 17th June 2005
6. Vessey J.K. (2003). Plant growth promotes rhizobacteria as biofertilizers. *Plant Soil*, 255:571–586
7. Fuentes-Ramirez LE, Caballero-Mellado J. Bacterial biofertilizers. In: Siddiqui ZA, editor. *PGPR: biocontrol and biofertilization*. The Netherlands: Springer; 2005. pp. 143–172.
8. Siddiqui ZA, Mahmood I. (1999). Role of bacteria in the management of plant parasitic nematodes. A review. *Bioresour Technol*; 69:167–179.
9. V. Ghumare, M. Rana, O. Gavka and B. Khachi (2014). Bio-fertilizers-increasing soil fertility and crop productivity. *J Indust Pollution Control*.
10. Niir Bord, The Complete Technology Book on Biofertilizer and Organic Farming, Niir Project Consultancy Services. pg. 39 Why Biofertilizers?
11. Article Shared by Deeptirekha Jain, Bio-fertilizers: Types and Importance of Bio-Fertilizers,
12. Yadav A.K. Biofertilizers, An input less exploited, National Centre of Organic Farming, Ghaziabad.

Plant Protection (Minor)

Semester-III

Skill Enhancement Course (SEC)

Practical Course -I &II(BBPP)

Sustainable Agricultural Practices

Course Objective: The students will be able to

1. familiarize with different organic composts
2. imparts knowledge about different methods of weed control.
3. understand the Knowledge about the preparation of biofertilizers.
4. acquire the knowledge about the importance of organic fertilizers.

Credits (2)	Name of Practical (specific names of practicals needed)	No. of hours (60)
	1. Visit to Organic farm to study the various components,	

	<p>identification, and utilization of Organic products.</p> <p>2-4. Preparation of Organic Compost-Over ground compost, Pit compost, Liquid compost, and Vermicompost.</p> <p>5. Preparation of Neem products and other botanicals for Pest and disease control.</p> <p>6. Weed control through organic way.</p> <p>7. Soil analysis: pH determination.</p> <p>8. Seed bed preparation, seed selection and seedling preparation.</p> <p>9. Method of application of different types of fertilizer and Green manure.</p> <p>10. Preparation of Panchagavya</p> <p>11-12. Organic crop production (Rice, Coconut)</p> <p>13-15. Organic crop production methods Vegetables (Any Two)</p> <p>15-16. Organic crop production methods Fruit crop (Banana, Mango)</p> <p>17-18. Organic crop production methods- spices ginger, turmeric</p> <p>19. Preparation of enrich compost</p> <p>20. Report writing on products available as a biopesticides, bio insecticides, Biofertilizers available nearby market.</p>	
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Course Outcomes: The Students will be able to

1. explain the types of biofertilizers used in the field.
2. discuss the importance of biofertilizers for increasing the production rate.
3. apply the knowledge of the production of biofertilizers.
4. demonstrate the use of biofertilizers in the field.

Reference:

1. Lampkin, N (1990) Organic Farming. Farming Press, Ipswich (ISBN 0 85236 191 2)

2. Lampkin, N & Measures, M (2004) 2004 Organic Farm Management Handbook. Organic Farming Research Unit, Aberystwyth (ISSN 1354 3768) & Organic Advisory Service, Berkshire (ISBN 1 872 064 388) Y
3. Younie, D & Wilkinson, J. M (eds) (2001) Organic Livestock Farming. Chalcombe Publications, Lincoln (ISBN 0 948617 45 4)
4. Younie, D., Taylor, B. R., Welsh, J. P & Wilkinson, J. M (eds) (2002) Organic Cereals and Pulses. Chalcombe Publications, Lincoln
5. Bavec, F. and Bavec, M. (2007). Organic Production and Use of Alternative Crops. CRC Press, Boca Raton, FL.
6. Kristensen, P., Taji, A. and Reganold, J. (2006). Organic Agriculture: A Global Perspective. CSIRO Press, Victoria, Australia.

Plant Protection (VEC)

Semester-III

BPPT-VEC-II: Environmental Studies in Plant Protection

Course Objectives: The students should be able to

1. understand the environmental issues.
2. relate that laws are made to safeguard the environment.
3. know the importance of sustainable development.
4. correlate knowledge of sustainable development with plant sciences.

Credits (02)	VEC Course -II (BBT-VEC-II): Environmental Awareness for Plant Scientist	No. of hours (30)
Unit I	Environmental issues	8
	1.1. Pollution (Air, Water and Land) 1.2. Fresh-water overuse 1.3. Natural disasters 1.4. Fuel and Energy shortage due to overuse 1.5. Increase in wasteland 1.6. Biodiversity loss 1.7. Global warming and climate change (Causes and intensity of the problem) 1.8. Role of Plant Protection in the creation of environmental issues	

Unit II	Environmental laws and ethics	8
	2.1 Environmental Protection Act 2.2 Wildlife Protection Act 2.3 Forest Conservation Act 2.4 Prevention and Control of Pollution Act (Air, water, and Land) 2.5 From unsustainable to sustainable development 2.6 Responsibilities of an Environmentally aware citizen.	
Unit III	Sustainable Development Goals	7
	3.1 Seventeen global sustainable goals	
Unit IV	Role of Plant Sciences in meeting the sustainable development goals.	7
	4.1 Examples and Case studies	

Course Outcomes: The students will be able to

1. explain the causes of environmental issues
2. discuss concepts related to environmental laws and ethics.
3. discuss the sustainable development goals.
4. Compare and analyze the importance of plant sciences in meeting sustainable development goals.

References:

1. Ravikrishnan A., Environmental Science and Engineering — Anna University of Technology, Tindivanam.
2. Samant J. S., Environmental Studies – Shivaji University Kolhapur.
3. Bharucha Erach, Environmental Studies - University Grants Commission New Delhi, and Bharati Vidyapeeth Institute of Environment Education & Research, Pune.
4. Agarwal, K.C., Environmental Biology, Nidi Pub. Ltd., Bikaner (2001).
5. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net (R).
6. Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
Clank R.S. Marine Pollution, Clanderson Press Oxford (TB).
7. Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p.
8. De A.K., Environmental Chemistry, Wiley Western Ltd.

Plant Protection (Major)
Theory Course III (BBPT.....)
Semester IV

Insect Pests and their Management

Course Objectives: The students should be able to

1. know the basic knowledge about the classification of insect pests
2. understand the knowledge about different types of insect pests and their nature of damage
3. impart the knowledge about the losses caused by insect
4. learn the knowledge about the management of insect pests.

Credits (2)	Theory Course II(BBPT.....)	No. of hours (30)
Unit I	Introduction to insect pests	(8)
	1.1 Definition and losses(qualitative and quantitative) caused by insect pests; 1.2 General characters of insect 1.3 Classification of insect pests based on 1.4 Nature of damage 1.5 Mouthparts 1.6 Metamorphosis	
UNIT II	Study of insect pests	(7)
	2.1 Study of following insect pests of different crops with reference to scientific name, Marks of identification, Nature of damage, Life cycle, management in the following: Jowar – Stem borer, Sugarcane – White grub, Gram– Pod borer, Mango – Jassids, Brinjal– Fruit borer, Rose – Aphids 2.2 Stored grain pests and their management with reference to scientific name, Marks of identification, Nature of damage, Life cycle, management in the following: Rice weevil, Pulse beetle	
UNIT III	Management of Insect pests	(8)
	3.1 Principles of Insect Pest Control 3.2 Classification of insecticides based on mode of entry – stomach, contact, systemic, Mode of action – Respiratory,	

	<p>Nervous;</p> <p>3.3 Chemical Nature Inorganic and Organic Insecticides: Sulphur and Organophosphates.</p> <p>3.4 Plant-origin insecticides: Azadirachtin, Pyrethrin and Nicotine</p> <p>3.5 Nature of formulation – Dusts, Granules, Wettable powder, Emulsifiable concentrates.</p> <p>3.6 IPM-Integrated Pest Management.</p>	
UNIT IV	Recent trends in pest management	(7)
	<p>4.1 Attractants; Repellants ; Antifeedants ; Pheromones; Chemosterilants</p> <p>4.2 Precautionary measures used during pesticide application</p>	

Course outcome: The students will be able to

1. understand about the losses caused by insect pest
2. realize the importance of identification of insect pests.
3. apply the advanced techniques for insect management
2. compare the chemical-based pesticide and biopesticide and then apply in field.

Reference:

1. L. P. Pedigo, ME Rice, RK Krell - 2021 – Entomology and Pest Management, Books.Google.Com
2. V. S, Birah Ajanta, K. Vikas, and C. Chartopadhyay. 2016. Success Stories of Integrated Pest Management In India. Edited By. Vennila, Birah Ajanta, ...
3. R. Kumar, Integrated Pest Management (Ipm): Concept And Approaches. June 2023.
4. A.S. Atwal And G.S. Dhaliwal: Agricultural Insect Pests Of South Asia And Their Management
5. B.V. David And V.V. Rammurthy: Elements Of Economic Entomology
6. Manishekharan and Sudarrajan : Pest Management in Field Crops
7. Pedigo L.P.: Entomology and Pest Management
8. Venu Gopal Rao: Insect Pest Management.
9. Principles and procedure of plant protection: Chattopadhyay

Plant Protection (Major)
Theory Course IV (BBPT.....)
Semester IV

Weeds and their management

Course objectives: The students should be able to

1. know the knowledge about weeds.
2. understand the knowledge of identification and morphology of agronomical weeds.
3. learn about the different methods of management of weeds.
4. impart the knowledge about laboratory techniques.

Credits (2)	SEMESTER-IV BBPT 402 Weeds and their management	No. of hours (30)
Unit-I	Introduction of weeds	(8)
	1.1. Weeds – Definition and losses caused by weeds 1.2. Classification of weeds based on Ontogeny, Ecology (ecological affinities, Soil type, Habitat, cotyledon number, soil pH) 1.3. Crop association 1.4. Reproduction and mode of dispersal of weeds 1.5. Study of parasitic and poisonous weeds.	
UNIT II	Study of following weeds with reference to	(7)
	2.1 Gross morphology for weed identification, Reproduction, Ecology, Dispersal, Management 2.2 Parthenium hysterophorus, Argemone mexicana, Celosia argentea, Euphorbia hirta, Amaranthus spinosus, Alternanthera sessilis. 2.3 Cyperus rotundus, Cynodon dactylon.	
UNIT III	Methods of weed management	(8)
	3.1 Mechanical methods - Ploughing, Hoeing, Hand weeding, Sickling and mowing, Burning and flooding, Mulching 3.2 Chemical methods - Classification of weedicides on the basis of chemical nature, mode of action, Study of weedicides with reference to properties, mode of action, formulation and uses of i) Glyphosate ii) Gramoxane (Paraquat). 3.3 Biological methods - Weed management by bacteria, fungi and insects.	
UNIT IV	Weed biology	(7)

	<p>4.1 Weed physiology after application of herbicides</p> <p>4.2 Absorption and translocation of herbicides</p> <p>4.3 Mechanism of action of herbicides with reference to photosynthesis.</p> <p>4.4 Concept of herbicide resistance.</p>	
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Course outcome: The students will be able to

1. realize the harmful effect of weeds on crops
2. discuss the importance of reproduction and dispersal of weeds.
3. demonstrate application methods for weed management.
4. explain the identification of agricultural weeds based on morphology

References:

1. Khuspe V.S and Subbaiah R, A Compendium of Indian Weed Science Research, Metropolitan, New Delhi (1982)
2. Subramanian S and Ali A.M, All About Weed Control, (2nd Edn.), Kalyani Pub., New Delhi (2011)
3. Joshi N.C, Manual of Weed Control, Research Publication, Delhi (1974)
4. Gupta O.P, Modern Weed Management, Agrobios Publications, India (2011)
5. Rao V.S. Principles of Weed Science, (2nd Edn.), Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (2000)
6. Gupta O.P., Scientific Weed Management, Today and Tomorrows, New Delhi (2011)
7. Robert H.A., Weed Control Handbook Principles, (9th Edn.), Blackwell Pub., New Delhi (1990)
8. King L.J., Weed of The World, (1st Edn.), Wiley Eastern, Mumbai (1966)
9. Thakur C., Weed Science, (2nd Edn.) Metropolitan, New Delhi (198).

Practical Course III&IV (BBPT.....)

Semester IV

Course Objectives: The students should be able to

1. know the basic knowledge about the classification of insect pests
2. understand the knowledge about different types of insect pests and their nature of damage
3. impart the knowledge about weeds.
4. impart the knowledge of the identification and morphology of agronomical weeds.

Credits (4)	Practical course Based on Paper 401, 402 Group A (group A + group B = 20 practicals)	No. of hours (120)
	<ol style="list-style-type: none"> 1. study of general characters of insect pests 2. Study of following insect pests with reference to scientific name, life cycle, marks of identification, nature of damage and management in the following: Jowar – Stem borer, 3. Sugarcane – White grub, 4. Gram– Pod borer, 5. Mango – Jassids, 6. Brinjal – Fruit borer 7. Rose –Thrips 8. Study of the following stored grain pests as per above points: Rice weevil 9. Study of the following stored grain pests as per above points: Pulse beetle. 10. Study of any two insecticides, bactericides and fungicides with reference to chemical nature, mode of action and uses. 11. Study of attractants and repellents (Any one from each group). 12. Technique of collection and preservation of insect pests 13. Study of pesticide application equipment: Sprayer and Fogger. 14. Preparation of pesticides for application (Examples). 	
	Group B	
	<ol style="list-style-type: none"> 1. Study of morphological characters for identification of weeds. 2-9 Study of following weeds with reference to gross morphology for identification, reproduction, dispersal and management: Dicot weeds: <i>Argemone Mexicana</i>, <i>Parthenium hysterophorus</i>, <i>Amaranthus spinosus</i>, <i>Alternanthera sessilis</i>, 	

	<p><i>Euphorbia</i> sp., <i>Celosia argentea</i>, Monocot weeds: <i>Cyperus rotundus</i>, <i>Cynodon dactylon</i></p> <p>10. Study of following weeds with reference to estimation of seeds by seed count method <i>Argemone mexicana</i>, <i>Celosia argentea</i> or any locally available weed as per syllabus</p> <p>11. Study of mode of dispersal in following weeds: <i>Parthenium hysterophorus</i>, <i>Tridax procumbens</i>, <i>Xanthium stromarium</i>, <i>Alternanthera</i> sp., <i>Achyranthus aspera</i>, <i>Cynodon dactylon</i></p> <p>12. Study of weedicides with reference to properties, mode of action formulation and uses of Glyphosate and Gramoxane</p> <p>13. Herbarium technique in weed.</p> <p>14. Survey of Weeds In Crop Fields from different habitats</p> <p>15. Visit to agricultural field/ institute.....</p> <p style="text-align: center;">20 practicals needed</p>	
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Course outcome: The students will be able to

1. realize the importance of identification of insect pests.
2. apply the advanced techniques for insect management
3. discuss the importance of reproduction and dispersal of weeds
4. explain the identification of agricultural weeds based on morphology

Reference:

1. Gupta O.P, Modern Weed Management, Agrobios Publications, India (2011)
2. Rao V.S. Principles of Weed Science, (2nd Edn.), Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (2000)
3. Gupta O.P., Scientific Weed Management, Today and Tomorrows, New Delhi (2011)
4. Robert H.A., Weed Control Handbook Principles, (9th Edn.), Blackwell Pub., New Delhi (1990)
5. King L.J., Weed of The World, (1st Edn.), Wiley Eastern, Mumbai (1966)
6. Thakur C., Weed Science, (2nd Edn.) Metropolitan, New Delhi (1984).

Plant Protection (Minor)
Theory Course IV (BBPT.....)
Semester IV

Weeds management in Horticultural crops

Course objectives: The students should be able to

1. know the knowledge about weeds.
2. understand the knowledge of identification and morphology of agronomical weeds.
3. learn about the different methods of management of weeds.
4. impart the knowledge about laboratory techniques.

Credits (2)	SEMESTER-IV BBPT Weeds management in Horticultural crops	No. of hours (30)
Unit-I	Introduction of weeds	(7)
	1.1. Weeds – Characteristics of weeds, Definition and losses caused by weeds; 1.2. Classification of weeds based on Ontogeny, Ecology (ecological affinities, Soil type, Habitat, cotyledon number, soil pH), 1.3. Reproduction and mode of dispersal of weeds; 1.4. Harmful and Beneficial effects of Weeds. 1.5. Allelopathic effects of weeds on Crops	
UNIT II	Study of following weeds with reference to	(8)
	2.1 Gross morphology for weed identification, Reproduction, Ecology, Dispersal, and Management in horticultural crops 2.2 Parthenium hysterophorus 2.3 Argemone mexicana 2.4 Cassia tora 2.5 Datura metal 2.6 Euphorbia geniculate	

	2.7 Lantana camera 2.8 Cyperus rotundus, 2.9 Cynodon dactylon.	
UNIT III	Methods of weed management	(8)
	3.1 Mechanical methods - Ploughing, Hoeing, Hand weeding, Sickling and mowing, Burning and flooding, Mulching 3.2 Chemical methods - Classification of weedicides on the basis of chemical nature, mode of action, Study of weedicides with reference to properties, mode of action, formulation and uses of 2-4 D, Glyphosate. 3.3 Biological methods - Weed management by bacteria, fungi and insects.	
UNIT IV	Weed Management in Horticultural Crops	(7)
	4.1 Tropical and Subtropical Fruit Crops: Mango, Banana, Pineapple, Grape, Papaya, Citrus, Guava 4.2 IWM (Integrated weed management)	

Course outcome: The students will be able to

1. realize the importance of identification of insect pests.
2. apply the advanced techniques for insect management
3. discuss the importance of reproduction and dispersal of weeds
4. explain the identification of agricultural weeds based on morphology

Reference:

1. Khuspe V.S and Subbaiah R, A Compendium of Indian Weed Science Research, Metropolitan, New Delhi (1982)
2. Subramanian S and Ali A.M, All About Weed Control, (2nd Edn.), Kalyani Pub., New Delhi (2011)
3. Joshi N.C, Manual of Weed Control, Research Publication, Delhi (1974)
4. Gupta O.P, Modern Weed Management, Agrobios Publications, India (2011)
5. Rao V.S. Principles of Weed Science, (2nd Edn.), Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (2000)
6. Gupta O.P., Scientific Weed Management, Today and Tomorrows, New Delhi (2011)

7. Robert H.A., Weed Control Handbook Principles, (9th Edn.), Blackwell Pub., New Delhi (1990)
8. King L.J., Weed of The World, (1st Edn.), Wiley Eastern, Mumbai (1966)
9. Thakur C., Weed Science, (2nd Edn.) Metropolitan, New Delhi (1984).

Plant Protection (Minor)

Practical Course IV (BBPT.....)

Semester IV

Weeds management in Horticultural Crops practicals

Course Outcomes: The students will be able to

1. understand the concepts of identification of weeds.
2. learn about the morphological characteristics of weeds.
3. acquire knowledge about different weeds.
4. learn about different modes of dispersal weeds.

Credits (2)	Based on Paper 402	No. of hours (60)
	<p>1. Identification of Weeds. (Based on morphological characters)</p> <p>2-9 Study of following weeds with reference to gross morphology for identification, reproduction, dispersal and management:</p> <p>Dicot weeds: <i>Argemone Mexicana</i>, <i>Parthenium hysterophorus</i>, <i>Amaranthus spinosus</i>, <i>Alternanthera sessilis</i>, <i>Euphorbia</i> sp., <i>Celosia argentea</i>,</p> <p>Monocot weeds: <i>Cyperus rotundus</i>, <i>Cynodon dactylon</i></p> <p>10. Study of following weeds with reference to estimation of seeds by seed count method <i>Argemone mexicana</i>, <i>Celosia argentea</i> or any locally available weed as per syllabus</p> <p>11. Study of mode of dispersal in following weeds: <i>Parthenium hysterophorus</i>, <i>Tridax procumbens</i>, <i>Xanthium stromarium</i>, <i>Alternanthera</i> sp., <i>Achyranthus aspera</i>, <i>Cyanodon dactylon</i></p>	

	<p>12. Study of weedicides with reference to properties, mode of action formulation and uses of Glyphosate and Gramoxane</p> <p>13. Herbarium technique in weed.</p> <p>14. Survey of Weeds In Crop Fields from different habitats</p> <p>15. Visit to agricultural field/ institute.....</p> <p style="text-align: center;">20 practicals needed</p>	
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Course Outcomes: The students will be able to

1. identify different weeds as per their morphology.
2. identify the types of weeds.
3. update the knowledge about the mode of action formulation uses.
4. Conduct a survey of weeds in crop fields from different habitats.

Reference: (need to add some references)

Plant Protection (VSC)

Semester IV

Post Harvest Management

Practical Course II (VSC)

Course Outcomes: The students will be able to

1. understand the knowledge about losses caused during handling of fruit/vegetables
2. learn about preservation methods after harvesting fruits/vegetables.
3. acquire knowledge about different methods used for the preparation of jam/jelly.
4. learn about different diseases that occur on fruits.

Credits (2)	Practical Course II (VSC) Practicals based on Course	No. of hours (60)
	<ol style="list-style-type: none">1. Study of Impact on post-harvest losses caused during handling.2. Study of a flow chart for post-harvest handling of fruits and vegetables.3. Study of types of harvesting methods.4. Study of methods of post-harvest handling.5. Study of types and methods of wax application.6. Study of types of packaging.7. Study of storage – traditional/low-cost and modern storage methods.8. Study of maturity index for fruits and vegetables.9. Study of types of storage containers.10. Study of types of handling protocol for selected fruit:<ol style="list-style-type: none">a) Amla-b) Apple-c) Tomato-d) Sapota-11. Study of post-harvest disease management.12. Study of storage of papaya.13. Study of preparation of jam.14. Study of preparation of jelly.15. Study of preparation of RTS (ready to serve), nectar (lemon	

	juice) and papaya RTS. 16. Study of preparation of squash and syrup orange. 17. Study of preparation of tomato ketchup/sauce/puree/paste. 18. Study of layout and packing of pack house. 19. Study of layout and planning of processing unit. 20. Visit to processing unit.	
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Course Outcomes: The students will be able to

1. know about the economic importance of fruits /vegetables.
2. identify the types of diseases that occur in fruits /vegetables.
3. update the knowledge about storage and packaging of post-harvest products.
4. Apply the knowledge about the preparation of jam/jelly.

Reference:

1. "Post-harvest Physiology of Food Crops" by W G Burton
2. Post Harvest Technology for Cereals, Pulses and Oilseeds" by Chakraverty A
3. "Post-Harvest Diseases and Disorders of Fruits and Vegetables: Volume 2: Vegetables" by Anna L Snowden
4. Crop Post–Harvest: Science and Technology: Principles and Practice" by Peter Golob and Graham Farrell
5. "Postharvest Technology and Food Process Engineering" by Amalendu Chakraverty and R Paul Singh
6. "Post Harvest Technology of Horticultural Crops" by Adel Kader

Plant Protection (SEC)

Semester IV

Soil and Water Management

Practical Course II (SEC) Semester IV

Course Objectives: The students should be able to

1. understand the basic knowledge about Soil and water management.
2. update the knowledge of agricultural soil management.
3. acquire knowledge about sustainable utilization of water.
4. apply the learnings to the day-to-day agricultural practices and life.

Credits (2)	Practical Course (SEC ____) Soil and Water Management	No. of hours (60)
	<ol style="list-style-type: none"> 1. Study of agricultural soil management. 2. Identification of different types of soil erosion in India. 3. Study of physical properties of soil: soil colour and water holding capacity. 4. Study of soil types in Maharashtra. 5. Study and identification of plants helping to prevent soil erosion. 6. Identification of soil horizons. 7. Study of agricultural soil analysis parameters. 8. Study of problem of Wind erosion of soil. 9. Study of types of soil waters. 10. Identification of soil and water conservation strategies. 11. Study of challenges in front of water management/conservation. 12. Study of Maharashtra Government scheme 'Jalyukta Shivar'. 13. Study of management methods to recharge ground water level. 14. Study and scrutiny of rain water harvesting method. 15. Study of factors affecting suitability of irrigation water. 16. Study of water conservation practices in irrigation. 17. Preparation of irrigation plan for a rainfed agricultural field. 18. Visit to a soil and water analysis laboratory. 19. Study of roles and responsibilities of soil and water analyst. 20. Water conservation through adapting practical water saving habits. 	

Course Outcomes: The students will be able to

1. explain the basic concepts of sustainable water conservation.
2. understand the concept of soil conservation for sustainable development.
3. discuss the knowledge of the management of natural resources.
4. learn about soil and water conservation methods and their applications in agriculture.

Reference:

1. Kateja Alpana. 2019. Water Resource Management: Problems and Prospects. Rawat Publications, Rajasthan.
2. .R. Sharma and A.K. Bera. 2018. Realizing Water Resource Management in India: Localizing Governance, Geospatial Data and Enabling Environment for Development. Rawat Publications, Rajasthan.
3. Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. Soil Fertility and fertilizers. 7th Ed. Prentice Hall.
4. Prasad R & Power JF. 1997. Soil Fertility Management for Sustainable Agriculture. CRC Press.
5. Yawalkar KS, Agrawal JP & Bokde S. 2000. Manures and Fertilizers. Agri-Horti Publications.
6. Miller C.E. and Turk L.M. 1972. Fundamentals of Soil Science. Biotech Books Pvt Ltd.
7. Rathinasamy A. and B. Bakiyathu Saliha. 2017. Fundamentals of Soil Science. Scientific Publishers, Jodhpur, India.
8. Das D. K. 2021. Introductory Soil Science. Kalyani Publishers, New Delhi.
9. Satyanarayana E. 2020. Glimpse of Soil Science. Narendra Publishing House.
10. Mishra B. 2007. Management of Soil Quality for Sustainable Agriculture. Satish Serial Publishing House.