Rayat Shikshan Sanstha's

Sadguru Gadage Maharaj College, Karad

(An Autonomous)

Syllabus Under Autonomy

For

B. Sc. II (Plant Protection)

Academic Year 2023 – 2024

Rayat Shikshan Sanstha's

Sadguru Gadage Maharaj College, Karad

(An Autonomous)

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

1. TITLE: Subject- Plant Protection
2. YEAR OF IMPLEMENTATION: Revised Syllabi will be implemented from June 2019 onwards.
3. PREAMBLE: The B. Sc. Plant Protection course under autonomy will be effective from the academic year 2023 – 2024. It has been prepared keeping in view the unique requirements of B. Sc. Plant Protection students. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences and its applications in agriculture. The emphasis is to provide students the latest information along with due weightage to the concepts of plant protection so that they are able to understand and appreciate the current interdisciplinary approaches in the study of plant sciences and its role in societal development. The course content also lists new practical exercises so the students gets a hands on experience of the latest techniques that are currently in use. The course will also inspire students to pursue higher studies, for becoming an entrepreneur and enable students to get employed in plant based industries.
4. GENERAL OBJECTIVES OF THE COURSE:
    - To impart knowledge of Science is the basic objective of education.
    - To develop scientific attitude is the major objective, i.e., to make the students open- minded, critical, curious.
    - To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute the science.
    - To understand scientific terms, concepts, facts, phenomenon and their relationships.
    - To make the students aware of natural resources and environment.
    - To provide practical experience to the students as a part of the course to develop scientific ability to work in the field of research and other fields of their own interest and to make them fit for society.
    - The students are expected to acquire knowledge of plant and related subjects so as to understand natural phenomenon, manipulation of nature and environment in the benefit of human beings.
    - To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self reliant and sufficient.

- To create the interest of the society in the subject and scientific hobbies, exhibitions and other similar activities.

5. DURATION: The course shall be a full time course.

6. PATTERN: Pattern of Examination will be CBCS Semester for theory and annual for practical.

7. STRUCTURE OF COURSE:

1) THIRD and FOURTH SEMESTER (NO. OF PAPERS – 04)

Sr. No.	Subject title	Theory					Annual Practical	
		Paper No. & Paper Code	Title of Paper	No. of period per week	Credits		No. of period per week	Credits
1	Plant Protection	Paper I: BBPT-301	Plant Pathology	3	2	Practical: I BBPP-303	8	4
		Paper II: BBPT-302	Major crops, methods of integrated Plant Protection	3	2			
2		Paper III: BBPT-401	Insect pests and their management	3	2	Practical: II BBPP-403	8	4
		Paper IV: BBPT- 402	Introduction to weeds and management	3	2			

2) Structure and titles of papers of B. Sc. II Plant Protection Course

B. Sc. II Semester III

Paper I: Plant pathology

Paper II: Major crops, methods of integrated Plant Protection

B. Sc. II Semester IV

Paper III: Insect pests and their management

Paper IV: Introduction to weeds and management

Annual Practical:

Plant Protection practical I (BBPP-303): Practical's based on theory paper I and II
Plant Protection practical II (BBPP- 403): Practical's based on theory paper III and IV

3) OTHER FEATURES:

A) LIBRARY:

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

B) SPECIFIC EQUIPMENTS:

a) Computer, LCD projector, Visualizer, Smart Board

b) Laboratory Equipments:

1. Microscope with digital camera
2. Digital weighing balance
3. pH meter
4. Microtome
5. Autoclave
6. Hot Air Oven
7. Incubator
8. Refrigerator
9. Stereo zoom microscope
10. Dissecting microscope

4) Evaluation Structure for B. Sc. II Plant Protection

Semester III

		Internal Exam	**Annual Practical**				**Total**
	SEE	**CCE**		Exam	Journal	Report on field visit/submission 10 photos of the crops/ weeds	
Paper I	40	10	**Practical - I**	40	5	5	**50**
Paper II	40	10					

Semester IV

		Internal Exam	**Annual Practical**				**Total**
	SEE	**CCE**		Exam	Journal	Submission of Plant diseases and insect pests/visit to agricultural field/institute	
Paper III	40	10	**Practical - II**	40	5	5	**50**
Paper IV	40	10					

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Bachelor of Science (B. Sc.) Part – II: Plant Protection

Semester III

Theory Paper I: BBPT 301- Plant Pathology

Learning objectives:

1. To apply the knowledge about crop diseases.
2. To interpret the knowledge of mechanism of plant infection.
3. To use the knowledge about the agricultural crop diseases.
4. To illustrate the knowledge about management of pathophysiological skills.

Total period: 30

Unit I: Concept of Plant diseases **(09)**

Definition and concept of disease.

Terminologies in Plant Pathology: Host, pathogen, pathogenicity, pathogenesis, symptoms, infection, incubation period, etiology, susceptibility, immunity, hypersensitivity, resistance

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.

Methods of studying plant pathogens: Koch's Postulates.

Unit II: Mechanism of penetration and plant infection **(05)**

Mechanism of penetration and infection.

Mode of infection and factors affecting infection

Unit III: Study of plant diseases: **(08)**

- Little leaf of Brinjal
- Yellow vein mosaic of Okra (Bhendi)
- *Citrus* canker
- Powdery mildew of *Gerbera*
- Blight of Marigold
- Rust of Soybean

- White Rust of Crucifers
- Brown rust of Wheat
- Grain smut of Jowar
- Tikka disease of Groundnut

Unit IV: Culture techniques and management of plant diseases (08)

Culture media and its types, Sterilization methods.

Management of plant diseases:

Cultural methods: Crop rotation, field sanitation, tillage practices, use of resistant cultivars etc.

Mechanical method: Eradication.

Chemical methods: General Classification of fungicides based on chemical nature and mode of action.

Study of properties, formulation, mode of action and uses of Carbendazim and Benomyl.

Learning outcome:

1. Student's generalize knowledge about crop diseases.
2. Student's apply the knowledge about mechanism of plant infection.
3. Student's implement the knowledge about the agricultural crop diseases**.**
4. Student's describe terminologies about management of crop diseases and pathophysiological skills.

References:

2. Plant pathology Agrios, George N. Academic Press, New York. (Unit I & II)
3. A Textbook of Modern Plant Pathology, Bilgrami K. S. Blackwel Science, USA. (Unit I, II & III)
4. Fundamentals of Plant Pathology Mehrotra. R.S, Aggarwal. A; McGraw Hill Education Private Limited, New Delhi (Unit I,II,III & IV)
5. Plant pathology Butler Edwin Periodical Expert,Delhi. (Unit I)
6. Text book of plant pathology Baruah H. K. Oxford Book, Calcutta (Unit III)
7. A Text book of Modern plant pathology Bilgrami K.S. Vikas, Mumbai. (Unit III)
8. Plant Pathology Butler, E.J., Jones, S.G. Periodical Expert, De. (Unit IV)
9. Experiments in Microbiology plant pathology and Tissue culture: Aneja K.R. Wishwa Prakashan, Daryaganj (Unit IV)
10. Laboratory Manual of plant pathology: Jain Vinod Kumar OxfordBook, Calcutta(Unit IV)
11. Principles and procedures of plant protection: Chattopadhyay S.B., Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (Unit IV)

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Bachelor of Science (B. Sc.) Part – II: Plant Protection

Semester III

Theory Paper II: BBPT 302- Major crops, Method of Integrated Plant Protection

Learning objectives:

1. To apply the knowledge about concept and importance of plant protection.
2. To generalize the knowledge of gross morphology & agronomy of agricultural crops.
3. To use the knowledge about the different methods of plant protection.
4. To interpret the knowledge about the recent methods of plant protection.

Total period: 30

Unit I: Introduction of plant protection and study of crops **(07)**

Definition, scope and importance of plant protection.

Study of agronomical practices with reference to following crops: Cereal – Jowar, Oil seed crop – Groundnut, Pulse crop – Gram, Cash crop - Sugarcane

Unit II: Study of horticultural crops **(08)**

Study of agronomical practices with reference to following crops: Fruit crop – Mango, Vegetable crop –Brinjal, Spice crop – Chilli, Floriculture – Marigold.

Eco-friendly Agricultural practices: Green manuring, Bio fertilizers and its types, Biofungicides, Biopesticides /Bioinsecticides

Unit III: Methods of plant disease management. **(08)**

IDM-Integrated Disease management

Cultural methods – tillage, crop rotation, trap crops, fertilizer applications

Mechanical methods – field sanitation, hand picking.

Physical methods – heat and soil solarisation.

Chemical methods –brief account and uses of Bactericides, Fungicides, Insecticides, Nematicides, Acaricides, Molluscicides and Rhodenticides.

Unit IV: Advanced methods of plant protection. **(07)**

Biological methods – Biological control of insect pests and crop diseases.

Legal method – Plant quarantine inIndia.

Crop resistance – use of resistant varieties and their examples.

Learning outcome:

1. Student's generalize the knowledge of importance of plant protection.
2. Student's describes gross morphology & agronomy of agricultural crops.
3. Student's implement the knowledge of different methods of plant protection
4. Student's apply the knowledge of recent methods of plant protection

References:

1. Agronomy V. J. -Vaidya *et. al*. Continental publication. (Unit I)
2. Commercial vegetable growing –Tindall, Oxford University Press 1972. (Unit I)
3. Principles and procedures of Plant Protection - Chattopadhyay, (Unit I)
4. Crop production and field experimentation- Vaidya Sahastrabudhe and Khupse (Unit I)
5. Floriculture - Waurie and Ries. (Unit II)
6. Cropping system theory and practice- V.N. Chattarjee oxford and BPH publishing Co.Pvt.Ltd (Unit II,III)
7. Handbook of Agriculture- IARI, New Delhi (Unit II)
8. Identification of crop varieties – Agarwal (Unit II,IV)
9. Scientific crop production, Mathur (Unit III)
10. Plant pathology (S Chand Publication) B.P. Pande (Unit III)
11. Plant pathology by Mukundam (Unit IV)
12. Plant protection by Mehrotra (Unit IV)

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Bachelor of Science (B. Sc.) Part – II: Plant Protection

Semester III

Practical Paper I: BBPP 303- Practical's based on Theory Paper I and II

Learning objectives:

1.To apply the knowledge about crop diseases.

2.To interpret the knowledge of mechanism of plant infection.

3.To use the knowledge about the agricultural crop diseases.

4.To apply the knowledge about concept and importance of plant protection.

5.To apply the knowledge of gross morphology & agronomy of agricultural crops.

6.To generalize the knowledge about the different methods of plant protection.

7.To interpret the knowledge about the recent methods of plant protection.

8 To acquire the knowledge about management of crop diseases and pathophysiological kills

Group A based on Paper I

1. Study of sterilization techniques.
2. Preparation of PDA culture medium.
3. Isolation technique- serial dilution**,**

4-5. Inoculation and identification of soil fungi.

6-7. Separation of amino acids from healthy and diseased plants using paper chromatography technique.

8. Determination of sucrose percentage by Hand refractometer in sugarcane and grape.

Group B based on Paper II

9-13. Study of following diseases in crops with reference to host, causal organism, symptoms and management. Yellow vein mosaic of okra (Bhendi), Little leaf of brinjal, *Citrus* canker, Rust of sugarcane, White rust of *Amaranthus* / Crucifers, Rust of wheat, Rust of soybean, Grain smut of jowar, Tikka disease of groundnut, Powdery mildew of *Gerbera*.

14-17. Agronomic studies of following crops with reference to gross morphology for crop identification and agronomic conditions- Jowar, Groundnut, Gram, Sugarcane, Mango, Brinjal, Chilli, *Gerbera*.

18-19. Eco friendly agro biochemicals:

- Green manuring: Sunhemp and Delchi.

- Biofertilizers: *Azolla* and *Nostoc*.
- Biopesticides: Azadirachtin and Pyrethrin.

20. Report on field visit/submission10 photos of the crops/ weeds

Learning Outcome:

1. Student's apply the knowledge about techniques involved in characterization of infections in plants.
2. Student's implement the knowledge about crop diseases and management.
3. Student's describe the gross morphology agronomy of crops**.**
4. Student's apply the knowledge about agricultural practices.
5. Student's use the knowledge about management methods of plant protection.
6. Student's implement the knowledge about collection and identification of crop diseases on the field

References:

1. Experiments in Microbiology plant pathology and Tissue Culture: Aneja K.R. Wishwa Prakashan, Daryajang
2. Laboratory Manual of plant pathology: Jain Vinod Kumar Oxford Book, Calcutta
3. Principles and Procedures of Plant Protection: Chattopadhyay, S.B. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi
4. Cropping system theory and practice- V.N. Chatterjee Oxford and BPH Publishing Co. Pvt. Ltd

Handbook of Agriculture- IARI, New Delhi

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Bachelor of Science (B. Sc.) Part – II: Plant Protection

Semester IV

Theory Paper III: BBPT 401- Insect pests and their management

Learning objectives:

1. To apply the knowledge about concept of entomology.
2. To interpret the knowledge of identification of agronomical pests.
3. To implement the knowledge about the different methods of management of insect pests
4. To acquire the knowledge about formulations of insecticides.

Total period: 30

Unit I: Introduction to insect pests **(06)**

Definition and losses (qualitative and quantitative) caused by insect pests.

General characters of insect.

Classification of insect pests based on: nature of damage, mouth parts, metamorphosis

Unit II: Study of insect pests **(09)**

Study of 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

Study of stored grain pests and their management with reference to –scientific name, marks of identification, nature ofdamage, life cycle, management in the following:

- Rice weevil
- Pulse beetle

Unit III: Management of Insect pests. **(09)**

Principles of insect pest control.

Classification of insecticides based on:

- **Mode of entry** – stomach, contact, systemic
- **Mode of action** – respiratory, nervous.
- **Chemical nature**- Inorganic and organic : Sulphur and Organophosphates.
- **Plant origin insecticides**: Azadirechtin, Pyrethrin and Nicotine.
- **Nature of formulation** –Dusts, granules, wettable powder, emulsifiable concentrates.
- **IPM**-Integrated Pest Management

Unit IV: Recent trends in pest management **(06)**

- **Attractants.**
- **Repellents.**
- **Antifeedants.**
- **Pheromones.**
- **Chemosterilants.**

Precautionary measures used during pesticide application.

Learning outcomes:

1. Student's state the concept of entomology.
2. Student's implement the knowledge about identification of agricultural pests.
3. Student's interpret the knowledge about the different methods of management of insect pests.
4. Student's generalize the knowledge about the formulations of insecticides.

References:

1. Agronomy V. J. -Vaidya *et. al*. Continental publication. (Unit I)
2. Commercial vegetable growing –Tindall, Oxford University Press 1972. (Unit I)
3. Principles and Procedures of Plant Protection - Chattopadhyay, (Unit I)
4. Crop production and field experimentation- Vaidya Sahastrabudhe and Khupse(Unit I)
5. plant protection by Mehrotra (Unit IV)
6. Agricultural pests of south east Asia By Atwal and Dhaliwal. (Unit II)
7. Cropping system theory and practice- V.N. Chattarjee oxford and BPH publishing Co.Pvt.Ltd(Unit II,III)
8. Handbook of Agriculture- IARI, New Delhi (Unit II)
9. Identification of crop varieties – Agarwal(Unit II,IV)
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11. Plant Pathology (S Chand Publication) B.P. Pande(Unit III)
12. Plant Pathology by Mukundam (Unit IV)

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Bachelor of Science (B. Sc.) Part – II: Plant Protection

Semester IV

Theory Paper IV: BBPT 402- Weeds and their management

Learning objectives:

1. To impart the knowledge about weeds.
2. To interpret the knowledge of identification and morphology of agronomical weeds.
3. To use the knowledge about the different methods of management of weeds.
4. To acquire the knowledge about laboratory techniques.

Total period: 30

Unit I: Introduction of weeds **(07)**

Weeds – Definition and losses caused by weeds.

Classification of weeds: based on Ontogeny, Ecology, crop association; Reproduction and mode of dispersal of weeds.

Study of parasitic and poisonous weeds.

Unit II: Study of following weeds with reference to: **(08)**

Gross morphology for weed identification, reproduction, ecology, dispersal, management:

Parthenium hysterophorus, Argemone mexicana, Celosia argentea, Euphorbia hirta, Amaranthus spinosus, Alternanthera sessilis, Cyperus rotundus, Cynodon dactylon, Eupatorium odoratum, Achyranthes aspera.

Unit III: Methods of weed management **(09)**

- **Mechanical methods** - ploughing, hoeing, hand weeding, sickling and mowing, burning and flooding, mulching.
- **Biological methods** - weed management by bacteria, fungi and insects.
- **Chemical methods** – general classification of weedicides on the basis of chemical nature, mode of action.

- **Study of weedicides**: Glyphosate and Gramoxane (Paraquat) with reference to properties, mode of action, formulation and uses.

Unit IV: Weed biology **(06)**

Weed physiology after application of herbicides.

Absorption and translocation of herbicides.

Mechanism of action of herbicides with reference to photosynthesis.

Concept of herbicides resistance.

Learning outcome:

1) Student's impart the knowledge about the morphology and ecology of weeds.
2) Student's use the knowledge of identification of agricultural weeds.
3) Student's implement the knowledge about the different methods of management of weeds.
4) Student's generalize the knowledge about laboratory techniques.

References:

1. Weed of The World King, L. J. Wiley Eastern, Mumbai (Unit I & II)
2. Principles of weed science Rao v.s. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi. (Unit I & II)
3. All about weed control: Subramanaian, S. Ali, AM Kalyanipub, New Delhi (Unit I & II)
4. Weed Science Thakur, C Metropolitan, New Delhi. (Unit I & II)
5. A Compendium of Indian weed science research: Khuspe, V.S, Subbaiah, R. Metropolitan, New Delhi. (Unit II)
6. Weed control handbook principles ROBERT H. A. .Blackwell Pub., New Delhi (Unit III,IV)
7. Weed management principles and practices Gupta, O.P. Agrobios, j (Unit III,IV)
8. Modern weed management GUPTA O.P. Agrobios, j (Unit III,IV)
9. Scientific weed management, Gupta, O. P., Today and Tomorrows, New Delhi (Unit III,IV)
10. Manual of weed control Joshi, N.C. Research Publication, Delhi. (Unit III)

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Bachelor of Science (B. Sc.) Part – II: Plant Protection

Semester IV

Practical Paper II: BBPP 403- Practical's based on Theory Paper III and IV

Learning objectives:

1. To give the knowledge about concept of entomology.
2. To apply the knowledge of identification of agronomical pests.
3. To implement the knowledge about the different methods of management of insect pests
4. To evaluate the knowledge about formulations of insecticides.
5. To impart the knowledge about weeds.
6. To interpret the knowledge of identification and morphology of agronomical weeds.
7. To acquire the knowledge about the different methods of management of weeds.
8. To describe the knowledge about laboratory techniques.

Group A passed on Paper III

1. Study of attractants and repellents (Any one from each group).

2-3. Study of any two insecticides, bactericides and fungicides with reference to chemical nature, mode of action and uses.

4. Technique of collection and preservation of insect pests.

5-7. Study of insect pests with reference to scientific name, life cycle, marks of identification, nature of damage and management in the following:

Jowar stem borer, Sugarcane white grub, Gram pod borer, Mango jassids, Brinjal fruit borer, Rose thrips

8. Study of following stored grain pests as per above points.

Rice weevil, Pulse bettle.

9. Study of pesticide application equipment: Sprayer and Fogger.

10. Preparation of pesticides for application (Examples).

Group B based on Paper IV

11-15. Study of following weeds with reference to gross morphology for identification, reproduction, dispersal and management.

Dicot weeds: *Argemone mexicana, Parthenium hysterophorus, Amaranthus spinosus, Alternanthera sessilis, Euphorbia* sp., *Celosia argentea*

Monocot weeds: *Cyperus rotundus, Cynodon dactylon*

16. Study of following weeds with reference to estimation of seeds by seed count method-

Argemone mexicana, Celosia argentia or any locally available weed as per syllabus.

17. Study of mode of dispersal in following weeds.

Parthenium hysterophorus, Tridax procumbens, Xanthium stromarium, Alternanthera sp., *Achyranthes aspera, Cyanodon dactylon*

18. Study of weedicides with reference to properties, mode of action formulation and uses of Glyphosate and Gramoxane

19. Herbarium technique in weed.

20. Submission of plant diseases and insect pests/Visit to agricultural field/institute.

Learning outcome:

1. Student's apply the knowledge about techniques of insect pest preservation and storage.
2. Student's discus about identification and management of insect and stored grain pests.
3. Student's implement the knowledge about the equipments used in application of insecticides and pesticides.
4. Student's recognize how to collect and identify the insects on the field.
5. Student's use the knowledge about the gross morphology for identification, reproduction, dispersal and managementof weeds.
6. Student's give the knowledge about weedicides.
7. Student's apply the knowledge about Herbarium technique for preserving weed collection.

References:

1. Agricultural pests of south east Asia By Atwal and Dhaliwal
2. Weed science **Thakur, C** Metropolitan, New Delhi
3. Weed of The World **King, L. J**. Wiley Eastern, Mumbai
4. Weed control Handbook Principles, **Robert H.A..** Blackwell Pub. New Delhi
5. Weed management principles and practices **Gupta, O.P.** Agrobios, j
6. Manual of weed control **Joshi, N.C** .Research Co. Publication