Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

**Ref.No.SU/BOS/Science/434** **Date: 15/07/2025**

**To,**

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

**Subject:** Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

**Ref:** No.SU/BOS/Science/270 & 271 Date: 03/05/2025 Letter.

**Sir/Madam,**

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper of B.Sc. Part-II (Sem.III & IV ) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

| B.Sc.Part-II (Sem. III & IV ) as per NEP-2020 (2.0) | | | |
|---|---|---|---|
| 1. | Botany | 8. | Geology |
| 2. | Statistics | 9. | Zoology |
| 3. | Mathematics | 10. | Chemistry |
| 4. | Microbiology | 11. | Electronics |
| 5. | Plant Protection | 12. | Industrial Microbiology |
| 6. | B.A./B.A.B.Ed. Geography | 13. | Biotechnology(Voc/Opt) |
| 7. | Biotechnology(Entire) | | |

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

**Dy Registrar**
**Dr. S. M. Kubal**

**Encl: As above**

**for Information and necessary action**

**Copy to:**

| | | | |
|---|---|---|---|
| 1 | Dean, Faculty of Science & Technology | 6 | Appointment Section A & B |
| 2 | Director, Board of Examinations and Evaluation | 7 | I.T.Cell /Computer Centre |
| 3 | Chairman, Respective Board of Studies | 8 | Eligibility Section |
| 4 | B.Sc.-M.Sc. Exam Section | 9 | Affiliation Section (T.1) (T.2) |
| 5 | Internal Quality Assurance Cell (IQAC Cell) | 10 | P.G. Seminar Section |

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दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

**Ref.No.SU/BOS/Science/270** **Date: 03/05/2025**

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The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

**Subject:** Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

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| B.Sc.Part-II (Sem. III & IV ) as per NEP-2020 (2.0) | | | |
|---|---|---|---|
| 1. | Botany | 8. | Geology |
| 2. | Physics | 9. | Zoology |
| 3. | Statistics | 10. | Chemistry |
| 4. | Mathematics | 11. | Electronics |
| 5. | Microbiology | 12. | Drug Chemistry |
| 6. | Plant Protection | 13. | Industrial Microbiology |
| 7. | Astrophysics and Space Science | 14. | Sugar Technology (Entire) |

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

**Yours faithfully,**

**By Registrar**
**Dr. S. M. Kubal**

**Encl: As above**

**for Information and necessary action**

**Copy to:**

| | | | |
|---|---|---|---|
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| 2 | Director, Board of Examinations and Evaluation | 7 | I.T.Cell /Computer Centre |
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| 5 | Internal Quality Assurance Cell (IQAC Cell) | 10 | P.G. Seminar Section |

# SHIVAJI UNIVERSITY, KOLHAPUR.

**Accredited By NAAC with 'A$^{++}$'Grade**

## Revised Syllabus For

## B. Sc. II Plant Protection (Minor Subject)

(Faculty of Science and Technology)

## Semester-III and Semester-IV

**NEP-2020 (2.0) Syllabus to be implemented from June, 2025 onwards**

# Shivaji University, Kolhapur

## Bachelor of Science Credit Framework

| | **SHIVAJI UNIVERSITY, KOLHAPUR**<br>**NEP-2020: Credit Framework for UG (B. Sc.) Programme under Faculty of Science and Technology** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **SEM (Level)** | COURSES | | | **OE** | **VSC/SEC** | **AEC/VEC/ IKS** | **OJT/FP/ CEP /CC/RP** | **Total Credits** | **Degree/Cum. Cr** |
| | **MAJOR** | | **MINOR** | | | | | | |
| **SEM III (5.0)** | Major V(2)<br>Major VI (2)<br>Major P III (2) | -- | Minor V(2)<br>Minor VI (2)<br>Minor P III(2) | OE-3(2) (T/P) | VSC I (2) (P) (Major specific)<br>SEC I (2) (T/P) | AEC I(2)<br>(English) | CC-I (2) | **22** | **UG Diploma 88** |
| **SEM IV (5.0)** | Major VII(2)<br>Major VIII (2)<br>Major P IV (2) | -- | Minor VII(2)<br>Minor VIII (2)<br>Minor P IV (2) | OE-4(2) (T/P) | SEC-II (2) (T/P) | AEC-II(2) (English) VEC-II(2) (Environmental studies) | CEP-I(2) | **22** | |
| **Credits** | **8(T)+4(P)=12** | | **8(T)+4(P)=12** | **2+2=4(T/P)** | **4(T/P)+2(P)=6** | **2+4=6** | **2+2=4** | **44** | **Exit Option:4 credits NSQF/Internship/Skill courses** |

**Abbreviations:**

MIN : Minor
OE : Open Elective
IDC : Inter-Disciplinary Course
MDC : Multi-Disciplinary Course
GE : Generic Elective
OEC : Open Elective Course SEC : Skill Enhancement Course VSC : Vocational Skill Course
AEC : Ability Enhancement Course VEC : Value Education Course OJT : On-Job Training
FP : Field Project
CEP : Community Engagement Programme
CC : Co-curricular Courses
RP : Research Project

**A]** **Ordinance and Regulations**: (As applicable to Degree Course)

**B]** **Shivaji University, Kolhapur**
Revised syllabus for Bachelor of Science

1. **TITLE:** Subject-Plant Protection Optional under the Faculty of Science and Technology

2. **YEAR OF IMPLEMENTATION**: -Revised Syllabi (As per NEP (2020) 2.0 will be implemented from June2025 onwards.

3. PREAMBLE: -

**[Note: -** The Board of Studies should briefly mention foundation, core and applied components of the course/paper. The student should get into the prime objectives andexpectedlevelofstudywithrequiredoutcomeintermsofbasicandadvanceknowledgeat examination level.**]**

4. GENERAL OBJECTIVES OF THE COURSE:(as applicable to the Degree concerned)

Objectives:

1) To impart knowledge of science is the basic objective of education.
2) To develop scientific attitude is the major objective to make the students open minded, critical, curious.
3) To develop skill in practical work, experiments and laboratory materials and equipment along with the collection and interpretation of scientific data to contribute the science.
4) To understand scientific terms, concepts, facts, phenomenon and their relationships.
5) To make the students aware of natural resources and environment.
6) 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.
7) 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.
8) 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.
9) 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 one year (Semester III and IV a) full-time course.

6. PATTERN: -

Pattern of Examination will be Semester wise.

**7.** FEESTRUCTURE: -

As per Government/University rules

1. Refer brochure and prospectus of concern affiliated college/institute to Shivaji University, Kolhapur.
2. Other fee will be applicable as per rules and norms of Shivaji University, Kolhapur.

**8.** ELIGIBILITY FOR ADMISSION:

As per guidelines obtained from Shivaji University, Kolhapur by following rules and regarding reservations by Govt. of Maharashtra

**9.** MEDIUM OF INSTRUCTION:

The medium of instruction shall be in English.

**10. STRUCTURE OF THE COURSE-B. Sc. II Plant Protection**

**SECOND YEAR (SEMESTER III/IV) (NO. OF PAPERS 4)**

| **Sr. No.** | **Subjects/Papers** | **Theory** | **Internal** | **Total Marks** |
|---|---|---|---|---|
| 1. | Minor Paper-V | 40 | 10 | 50 |
| 2. | Minor Paper-VI | 40 | 10 | 50 |
| | Practical-III | -- | -- | 50 |
| | Minor Paper-VII | 40 | 10 | 50 |
| | Minor Paper-VIII | 40 | 10 | 50 |
| | Practical-IV | -- | -- | 50 |
| **Total** | | | | **300** |

**11.** SCHEME OF TEACHING AND EXAMINATION: -

[The scheme of teaching and examination should be given as applicable to the course/paper concerned.]

SECOND YEAR-SEMESTER–III/IV: Plant Protection (Optional)
Scheme of Teaching and Examination

| Sr .No. | Subject/Paper | Teaching Scheme (Hrs/ Week) | | | | Examination Scheme (Marks) | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | Theory | Term Work | Total |
| | **Semester-III** | | | | | | | |
| 1 | Minor Paper-V | 02 | - | - | 02 | 40 | 10 | 50 |
| 2 | Minor Paper-VI | 02 | - | - | 02 | 40 | 10 | 50 |
| | Practical-III | - | - | 02 | 02 | - | - | 50 |
| | **Semester-IV** | | | | | | | |
| 3 | Minor Paper-VII | 02 | - | - | 02 | 40 | 10 | 50 |
| 4 | Minor Paper-VIII | 02 | - | - | 02 | 40 | 10 | 50 |
| | Practical-IV | - | - | 02 | 02 | - | - | 50 |
| | Total | 08 | - | 04 | 12 | - | - | 300 |

**12.** SCHEME OF EXAMINATION: -

- The examination shall be conducted at the end of each term for semester pattern.
- The theory paper shall carry 40 marks.
- The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of 40 marks.
- The internal evaluation for each paper shall carry 10 marks. (Semester III -Unit Test and Semester IV- Oral examination/ Group Discussion)
- Question paper will be set in the view of the/in accordance with the entire syllabus and preferably covering each unit of syllabi.

**13.** STANDARD OF PASSING: -
As Prescribed under rules and regulation for each degree.

**14.** NATURE OF QUESTION PAPER AND SCHEME OF MARKING:
Duration of the paper: as per the rules of Shivaji University Kolhapur

Q.1. Multiple choices questions (8-questions) --- 8 Marks
Q.2.Attempt **any two** of the following.
(Essay type/ Broad answer questions) ---- 16 Marks
Q.3Write short notes (**any four**) --- 16 Marks

Follow the rules of Shivaji University Kolhapur regarding NEP-2020 syllabus and examination.

**15.** EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OFPAPERS- (FOR REVISED SYLLABUS)

**(Introduced from June 2025 onwards)**

| Old Syllabus (Semester pattern) | | New Syllabus (Semester pattern) | | |
|---|---|---|---|---|
| Paper No. | Title of Old Paper | Semester No. | Paper No. | Title of New Paper |
| I | Introduction to Plant Protection and Study of Major Crops | III | Minor V | Plant Pathology and Plant Disease Management |
| II | Plant Pathology | | /Minor VI | Emerging Trends in Plant Protection |
| III | Introduction to Weeds and Weed Management | IV | Minor VII | Seed Technology |
| IV | Insect Pests, Non-Insect Pests and Their Management | | Minor VIII | Advances in Plant Protection |

# Course Outcomes:

**Paper V:**

After successful completion of the course, the students will be able to

1. Know the scope and importance of the agronomy in the field of agriculture.
2. Identify different varieties of the crops and their significant role
3. Know the cultural practices of the different crops.
4. Develop the skill to prepare different types of manures and biofertilizers.

**Paper VI:**

After successful completion of the course, the students will be able to

1. Know the scope and importance of the agronomy in the field of agriculture.
2. Know the mode of dispersion of pathogen.
3. Identify different plant diseases and their management.
4. Acquaint the broadcasting of plant diseases.

**Paper VII:**

After successful completion of the course, the students will be able to

1. Know the scope and importance of the plant pathology in the field of agriculture.

2. Identify different weeds and know the management practices.

3. Prepare the formulations of different herbicides, fungicides and pesticides.

4. Manage the plant diseases from the field.

**Paper VIII:**

After successful completion of the course, the students will be able to

1. Know the scope and importance of entomology in the field of agriculture.

2. Identify different insect pests and their management.

3. Identify different non insect pests and their management.

4. Prepare the formulations of different pesticides.

## PRACTICALS IN PLANT PROTECTION

**Study Tour/ Excursion:**

One teacher along with a batch not more than 20 students is taken for excursions to places of study interest, one in each term. If there are female students in a batch of sixteen, one additional lady teacher is permissible for excursion. Each excursion will not be more than 3 days during college working days. T.A. and D.A. for teachers and non-teaching staff participating in the excursions should be paid as per the rules. The tour report duly certified by the concerned teacher and the head of the department should be submitted at the time of practical examination.

**Details of Practical Examination:**

B. Sc. II Plant Protection Practical III and IV are to be covered in 15 practical each. These practicals are to be performed by the students.

Every candidate must produce a certificate from Head of the Department in his / her college stating that he / she has completed practical course in a satisfactory manner as per the lines laid down by academic council on the recommendations of Board of Studies in Botany. The student should record his / her observations and report of each experiment should be written in the Journal.

The Journal is to be signed periodically by teacher in charge and certified by Head of the Department at the end of the year. Candidates have to produce their certified journal and tour reports at the time of practical examination.

**A candidate allowed to appear for the practical examination with a complete and certified journal, otherwise a candidate must produce a separate certificate of his/her regular attendance of practical course and completion of the same signed by the concerned teacher and Head of the Department.**

**MINOR PAPER V: PLANT PATHOLOGY AND PLANT DISEASE MANAGEMENT**

## CREDIT: 2. LECTURE HOURS: 2 PER WEEK; MARKS: 50

| MODULE NO. | SUB MODULE | TOPIC | LECTURES ALLOTTED |
|---|---|---|---|
| **1** | **Fundamentals and Techniques in Plant Pathology** | 1.1. Importance of plant diseases, scope and objectives of Plant Pathology | **15** |
| | | 1.2 Indian Agricultural Research Institute (IARI): Brief Introduction and Scope | |
| | | 1.3 Chirayathumadom Venatically Subramanian – Introduction and Scientific contribution in mycology and Plant pathology. | |
| | | **1.4 Important terminologies in Plant Pathology:** Appressorium, Contamination, Disease, Disease complex, Disease cycle, Disease Syndrome, Disorder, Obligate Parasite, Facultative parasite, Facultative saprophyte, Haustorium, Inoculum, Inoculum potential, Monocyclic, Polycyclic, Symptoms. | |
| | | **1.5. Techniques in Plant pathology-**<br>**a. Culture Media:** Concept and Basic types (synthetic media- (Nutrient Agar), Semisynthetic (Potato Dextrose Agar).<br>**b. Pure Culture:** Concept of pure culture, Techniques of pure culture- (Streak plate and pour plate).<br>**c. sterilization:** Concept of sterilization, Moist heat type of sterilization – Autoclave (Parts/ Components and Uses)<br>**1.6. Instruments in Plant pathology-**<br>**a. Laminar air flow** (Structure and Advantages)<br>**incubator** (Lab Incubator Components/Parts and applications)<br>**micrometry:** (Types- ocular micrometer and stage micrometer, use of micrometry) | |
| **2** | **Plant diseases and Their management** | **2.1 Plant disease diagnosis**-Steps in disease diagnosis<br>**2.2 Classification of plant diseases-** On the basis of their mode of perpetuation and mode of primary infection-<br>**a. Soil borne diseases** –Concept and mode of transmission of pathogen in Wilt of Tomato.<br>**b. Air borne diseases**- Concept and mode of transmission of pathogen in Wheat Rust.<br>**c. Seed borne diseases**- Concept and mode of transmission of pathogen in Grain Smut of Jowar | **15** |

| | | | |
|---|---|---|---|
| | | **2.3 Study the following diseases with reference to Host, causal organism, Symptoms and control measures.**<br>**a) Fungal Diseases-**<br>I. Anthracnose of Papaya<br>II. Black Rot of Grapes<br>**b) Viral disease**<br>Leaf Curl of Chilli<br>**c) Bacterial Disease**<br>Bacterial Blight of Pomegranate<br>**d) Mycoplasma Disease**<br>Little Leaf of Brinjal | |
| | | **2.4 Methods of plant disease management**<br>**a) Regulatory methods-**<br>Quarantine and Inspection<br>Seed Certification<br>**b) Cultural methods-**<br>Host Eradication<br>Crop Rotation<br>Sanitation<br>Polyethylene Traps and Mulches<br>**c) Biological methods-**<br>Antagonistic Microorganisms- Trichoderma<br>Control through Trap Plants- Carrot<br>**d) Physical methods-**<br>Soil Solarization<br>Hot-Water Treatment of Propagative Organs<br>Radiation<br>**e) Chemical methods**<br>Seed Treatment<br>Disinfection of agricultural equipment | |

**SEMESTER III**

**PLANT PROTECTION**

**MINOR PAPER VI: EMERGING TRENDS IN PLANT PROTECTION**

## CREDIT: 2. LECTURE HOURS: 2 PER WEEK; MARKS: 50

| MODULE | SUB-MODULE | TOPIC | LECTURES ALLOTTED |
|---|---|---|---|
| 1 | Precision Agriculture and its tools | 1.1 **Precision Agriculture:** Definition, Decision making and Planning<br>1.2 **Benefits of Precision Agriculture**:<br>a) Economic benefits<br>b) Improvement in farm management practices<br>c) Administration, record keeping, and marketing<br>1.3 **Agri market Apps** – Kisan Suvidha<br>1.4 **Intelligent Devices and Instruments** (IDI devices) usage in Precision Agriculture: Yield monitor, Variable Rate Technology (VRT) Application (Fertilizer).<br>1.5 Weather forecasting: Design and functions of Soil thermometer, Hair hygrometer, rain Gauge, Anemometer<br>1.6 Use of pesticide by Drone technology | 15 |
| 2 | Organic Farming | 2.1**Organic farming**: Definition, concept, principles, Need of organic farming and its status in India<br>2.2 Advantages and challenges of organic farming.<br>2.3 Types of organic farming (Pure, Integrated)<br>2.4 National Mission on Organic farming, Case Study/success story - Subhash Palekar<br>2.5 Traditional techniques in Organic Farming:<br>A. Biofertilizers: Jivamrut, Dashparni Ark<br>B. Biopesticides and Repellents: Neem and Garlic<br>2.6 Modern techniques in organic farming-<br>A. Biological Control Agents: Fungal Bioagents: *Trichoderma* (to control soil-borne fungi); Predatory insects: Ladybugs (to control aphids), Lacewings (to control whiteflies)<br>B. Microorganisms for Soil Health: VAM fungi<br>C. Biological Fertilizers: Rhizobium<br>2.7 Applications of Artificial Intelligence (AI) in modern farming. | 15 |

# Shivaji University, Kolhapur

## Practical-III

## (Based on Minor Paper V and VI)

**CREDIT: 2** **PRACTICAL HOURS:60** **Total Marks 50**

| | |
|---|---|
| 1 | Preparation of PDA culture Media |
| 2 | Measure the dimension of fungal spore by micrometry techniques. |
| 3 | Study of Soil and its physical characters. |
| 4 | Study of different types of soil, (Soil types- Alluvial, Laterite, Clay, Loam) etc. |
| 5 | Isolation of soil fungi by serial dilution technique |
| 6 | Isolation of Air borne fungi by sedimentation plate method or settle plate method. |
| 7-8 | Isolation of Seed borne by blotter paper method. |
| 9 | Study the fungal, bacterial viral and Phytoplasma diseases as per theory with reference to Host, causal organism, Symptoms and control measures |
| 10 | Study of meteorological instruments. |
| 11 | Preparation of Jivamrut |
| 12 | Preparation of Dashparni Ark. |
| 13 | Study of biocontrol agents |
| 14 | Study of biopesticide |
| 15 | Visit to Organic Farm. |

## List of Books recommended for B. Sc. II Plant Protection

### MINOR PAPER V: PLANT PATHOLOGY AND PLANT DISEASE MANAGEMENT

1. A Text book of Modern Plant Pathology Bilgrami K.S. Vikas, Mumbai.
2. Textbook of Modern Plant Pathology, Bilgrami K. S., Blackwel Science, USA.
3. Principles and Procedures of Plant Protection – Chattopadhyay
4. Plant Pathology (S Chand Publication) B. P. Pande.
5. Plant pathology by Mukundam
6. Essentials of Agronomical Entomology. Dhaliwal, Singh, Chhilar. Kalyani Publication.
7. Handbook of Agriculture- IARI, New Delhi.

### MINOR PAPER VI: EMERGING TRENDS IN PLANT PROTECTION

1. **HANDBOOK OF PRECISION AGRICULTURE – PRINCIPLES AND APPLICATIONS** edited by Ancha Srinivasan. Food Product Press, an imprint of The Haworth Press, Inc. New York. Published in 2006, (soft cover), price $89.95, 684 pp., ISBN-13: 978-1-56022-955-1.
2. **PRECISION AGRICULTURE**
   Terry A. Brase. Thomson Delmar Learning, New York, USA. Published in 2006, (hardcover), price $69.95, 224 pp., ISBN 10: 1-4018-8105-X.
3. **PRECISION AGRICULTURE**

’05 edited by John V. Stafford. Wageningen Academic Publishers, Wageningen, The Netherlands. Published in 2005, (hardcover), price $165, 1005 pp., ISBN-13:978-90-76998-69-8

# SEMISTER IV

**SEMESTER IV**

**PLANT PROTECTION**
**MINOR PAPER VII: SEED TECHNOLOGY**

**CREDIT: 2. LECTURE HOURS: 2 PER WEEK; MARKS: 50**

| MODULE | SUB - MODULE | TOPIC | LECTURES ALLOTTED |
|---|---|---|---|
| **1** | **1a. Seed and Seed Packing** | 1.7 **Concept of Seed**, Morphology Definition, Difference between Seed and Grain.<br>1.8 **Types of seeds-** Monocot Seed (e.g. Maize Seed), Dicot Seed (e.g. ground nut Seed)<br>1.9 **Seed storage** – Structures and their management.<br>1.10 **Toxins affecting seeds—**Mycotoxins - types and effects. Different types of fungal mycotoxins affect seeds. Control measures for mycotoxins.<br>1.11 Objectives of seed health testing, procedures of sampling methods of seed health testing.<br>1.12 **Packing and marketing seeds:** bagger weigher, bag closing, portable and conveyor type of bag closer, labelling and maintaining lot identity, lot numbers, seed pellets, handling and staking, maintenance of seed processing record. | **08** |
| | **1b. Seed Pathology** | **1.5 Introduction of seed pathology**: Introduction, history, and importance of seed pathology.<br>**1.6** Types of seed-borne diseases: fungi, bacteria, viruses, and nematodes.<br>**1.7** Mechanism of transmission of seed pathogens.<br>**1.8** Economic significance of epidemic and seed-borne disease. (Ear rot of Maize, Loose smut of Wheat, brinjal fruit rot)<br>**1.9** Losses caused by seed-borne pathogens.<br>**1.10** Seed-borne diseases and management: Preventive measures for seed-borne pathogens practiced in India. | **07** |
| **2** | **2a Seed Entomology** | **2.1 Introduction to seed entomology**: History and economic importance of Seed Entomology.<br>**2.2 Study of the following insect pests with respect to the scientific name, marks of identification, nature of the damage, and their management**<br>1. Legume Pod Borer (*Maruca vitrata*)<br>2. Guava Fruit Fly (*Bactrocera correcta*)<br>3. Tomato Fruit Borer (*Helicoverpa armigera*)<br>**2.3 Study of stored grain pests, their nature of damage, and management:**<br>1. Lesser Grain Borer (*Rhyzopertha dominica*) | **08** |

| | | | |
|---|---|---|---|
| | | 2. Khapra Beetle (*Trogoderma granarium*) | |
| | **2b Management of Seed Insects** | **2.4 Pre-Harvest Pest Management**<br>• **Cultural practices:** Crop rotation and intercropping, Early sowing and timely harvesting, Resistant seed varieties.<br>• **Biological control:** Use of natural enemies (e.g., parasitoids like *Trichogramma*), Microbial agents like *Bacillus thuringiensis* (Bt).<br>• **Chemical control:** Application of insecticides during the crop stage, Avoiding resistance development through rotational use.<br>**2.5 Post-Harvest Pest Management**<br>• **Physical methods:** Proper drying of seeds before storage. Use of hermetic storage containers and cold or heat treatments for stored seeds.<br>• **Biological methods:** Use of predators or parasitoids in storage.<br>• **Chemical methods:** Fumigation with phosphine or methyl bromide. Surface treatments with safe insecticides. | **07** |

**SEMESTER IV**
**PLANT PROTECTION**
**MINOR PAPER VIII: ADVANCES IN PLANT PROTECTION**

## CREDIT: 2. LECTURE HOURS: 2 PER WEEK; MARKS: 50

| MODULE | SUB-MODULE | TOPIC | LECTURES ALLOTTED |
|---|---|---|---|
| 1 | Advanced Techniques Used in Plant Protection | 1.1 **Entrepreneurship in Plant Protection –** **Challenges:** Regulatory approvals, high R&D costs, farmer adoption barriers. **Opportunities:** Growing demand for organic produce, government incentives, and technological advancements.<br>1.2 **a) Sustainable Pesticide Alternatives-** Manufacturing and selling neem-based, herbal, or microbial pesticides, Developing pheromone traps and biological control methods. **b) Urban and Vertical Farming Solutions -** Implementing plant protection solutions for urban gardens and vertical farms, Creating hydroponic and aeroponic systems with built-in pest control measures. c) **Agri-Input Supply Chain and Distribution -** Establishing a distribution network for safe and approved plant protection products, developing an e-commerce platform for farmers to access pest control solutions. | 08 |
| | | 1.3 **Introduction to Pest Forecasting -** Definition, scope, role, and importance of pest forecasting in IPM.<br>1.4 **Role of Technology in Pest Forecasting -** Use of IoT devices for real-time pest monitoring. Remote sensing and drones in pest detection. Use of pheromone traps, light traps, and sticky traps in pest monitoring. | 07 |
| 2 | Biotechnology in Plant Protection | 2.1 **Introduction to Biotechnology in Plant Protection -** Definition and scope of biotechnology in agriculture. Importance of biotechnology for plant protection.<br>2.2 **Development of genetically modified (GM) crops:** Bt crops (e.g., Bt maize) for insect resistance. Virus-resistant crops (e.g., transgenic papaya for Papaya Ring Spot Virus). | 08 |
| | | **2.3. Advances in Weed Biology and Ecology** Adaptation of weeds to agroecosystems and climate change. Allelopathy: Mechanisms and applications in weed management.<br>**2.4 Sustainable Weed Management Approaches** Integrated Weed Management (IWM): Principles and case studies. Role of cover crops, crop rotation, and conservation tillage. Advances in biological control; bioherbicides, microbial agents, and insect biocontrol. | 07 |

# Shivaji University, Kolhapur
## Practical-IV
## (Based on Minor Paper VII and VIII)

**CREDIT: 2 PRACTICAL HOURS:60 Total Marks 50**

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| 1 | Study of the external and internal structure of monocot. (e.g. Maize seed) and dicot seeds (e.g. Groundnut). |
| 2 | Seed viability test by TTC method. |
| 3 | Measurement of seed moisture content by oven drying method in healthy and infected seeds. |
| 4 and 5 | Study of the following insect pests with respect to the scientific name, marks of identification, nature of the damage, and their management: Legume Pod Borer, Guava Fruit Fly, Tomato Fruit Borer |
| 6 | Study of Stored grain pests: Lesser Grain Borer, Khapra Beetle |
| 7 | Pest Monitoring Tools: Pheromone traps, light traps, and sticky traps. |
| 8 | Thin-Layer Chromatography (TLC): Separation of plant amino acids in healthy and infected plant extract. |
| 9 | Studying seed dormancy and germination under various conditions. |
| 10 | Analysis of allelopathic effects of weeds on crop growth. |
| 11 | To screen and evaluate microbial agents for their bioherbicidal properties against selected weed species. |
| 12 | Study of insects used as bio-agent in weed control. (Ex. *Zygogramma bicolorata* feeding on *Parthenium hysterophorus,* and *Cactoblastis cactorum* feeding on *Opuntia spp.*). |
| 13 | Preparation of vertical garden with the available sources. |
| 14 | Demonstration of hydroponics technique. |
| 15 | Mock Preparation of Phytosanitary Certificates: Create a mock exercise where students fill out a phytosanitary certificate to export an agricultural product (e.g., mangoes). Highlight necessary details such as country of origin, pest-free status, and certification authority |

# List of Books recommended for B. Sc. II Plant Protection

## MAINOR PAPER VII-SEED TECHNOLOGY


1. Agarwal V. K, and Sinclair J.B, (1993). Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi.
2. Agrawal, (2018) Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
3. Joshi A. K., and Singh B. D., (2017). Seed Science and Technology; Edition. Revised; Publisher.
   Kalyani Publishers.
4. Hutchins J. D. and Reeves J. E., (Eds.). (1997). Seed Health Testing: Progress Towards the 21st
   Century. CABI, Wallington.
5. Paul Neergaard., (1988). Seed Pathology. MacMillan, London.
6. Suryanarayana D., (1978). Seed Pathology. Vikash Publ., New Delhi
7. Singh C. B. (2014). Handbook of Seed Testing. New Delhi: Anmol Publication.
8. Khare D., Bhale M.S. (2014) Seed Technology. 2nd ed. Jodhpur: Scientific Publisher.
9. Ransingh S., Kalhapure A. (2013): Principals of Seed Technology. Pune: Universal Publication.


## MAINOR PAPER VIII: ADVANCES IN PLANT PROTECTION


**1.** Plant Protection Principles and Practices: S. B. Sharma Publisher: CBS Publishers and Distributors Pvt. Ltd., India

**2.** Plant Quarantine and Biosecurity: P. Narayanasamy Publisher: Springer Science and Business Media

**3.** Plant Protection and Quarantine: C. D. Mayee Publisher: Agrotech Publishing Academy, Jaipur, Rajasthan, India

**4.** Integrated Pest Management: Concepts and Applications: O. P. Singh Publisher: Kalyani Publishers, Ludhiana, Punjab, India

**5.** Biotechnology for Pest and Disease Management: R. P. Singh and U. S. Singh Publisher: CABI Publishing

**6.** Transgenic Crops and Biosafety Concerns: K. M. Ravi Kumar and B. N. Reddy Publisher: New India Publishing Agency

**7.** Biopesticides: Use and Delivery: Franklin R. Hall and Julius J. Menn Publisher: Springer Science and Business Media

**8.** Neem: A Treatise: S. P. Maheshwari and K. G. Ramawat Publisher: Studium Press LLC

**9.** Plant-Derived Pesticides: M. Jacobson Publisher: CRC Press

**10.** Nanotechnology for Sustainable Agriculture: S. K. Brar and S. Verma Publisher: Apple Academic Press

**11.** Plant Biotechnology and Genetics: Dr. R. C. Dubey Publisher: S. Chand Publishing, 7361, Ram

Nagar, New Delhi – 110055, India

**12.** Biotechnology for Sustainable Agriculture: R. K. Sharma and H. S. Gill Publisher: New India Publishing Agency, 101, Vikas Surya Plaza, Sector-12, Dwarka, New Delhi - 110078, India

**13.** Agricultural Biotechnology: Arun K. Sharma Publisher: Oxford and IBH Publishing Co. Pvt. Ltd., 4662/21, Daryaganj, New Delhi – 110002, India

**14.** Natural Pesticides in Agriculture: R. Mathur Publisher: Agrobios (India), Behind Nasrani Cinema, Chopasni Road, Jodhpur - 342002, Rajasthan, India.

**15.** Biopesticides in Sustainable Agriculture: M. S. Chari Publisher: Scientific Publishers, 5 A, New Pali Road, Jodhpur - 342001, Rajasthan, India.

**16.** Nanotechnology in Agriculture: T. Pradeep Publisher: Indian Institute of Technology Madras (IIT-M) Publications, Chennai, Tamil Nadu, India

**17.** Laboratory Manual of Plant Biotechnology: S. Ignacimuthu Publisher: Narosa Publishing House

**18.** Practical Manual of Biopesticides and Biofertilizers: K. Rajmohan Publisher: Agrobios (India).

**19.** Manual of Plant Protection: V. P. Agrawal Publisher: CBS Publishers and Distributors Pvt. Ltd., 4596/1-A, 11 Daryaganj, New Delhi – 110002, India

**20.** Laboratory Manual on Pesticides and Residue Analysis: Dr. S. N. Gupta Publisher: Scientific Publishers, 5 A, New Pali Road, Jodhpur - 342001, Rajasthan, India.

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