

Shivaji University, Kolhapur



**New Syllabus For  
Bachelor of Science  
SEED TECHNOLOGY Paper –IX, X, XI, XII  
Semester –V and VI**

**B.Sc. Part III Seed Technology (SEMESTER PATTERN)**  
**New Syllabus to be implemented from June 2015**

**Semester V**

Paper IX Seed Pathology  
Paper X Seed Entomology

**Semester VI**

Paper XI Seed Processing and Storage  
Paper XII Seed Farm Management and Marketing

**THIRD YEAR (SEMESTER V/VI) (NO.OF PAPERS 4)**

<b>Sr. No.</b>	<b>Papers</b>	<b>Theory</b>	<b>Internal</b>	<b>Total Marks</b>
<b>1.</b>	SEM V - Paper IX	40	10	<b>50</b>
<b>2.</b>	-Paper X	40	10	<b>50</b>
<b>3.</b>	SEM VI- Paper XI	40	10	<b>50</b>
<b>4.</b>	-Paper XII	40	10	<b>50</b>
<b>5.</b>	Practical I			<b>50</b>
<b>6.</b>	Practical II			<b>50</b>
	<b>Total</b>			<b>300</b>

**SCHEME OF EXAMINATION: -**

- i. The examination shall be conducted at the end of each academic year for annual pattern and at the end of each term for semester pattern.
- ii. Each theory paper shall carry 40 marks and internal assessment 10marks
- iii. The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of \_\_\_\_\_ marks.
- iv. Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabi.

**STANDARD OF PASSING: -**

**[As Prescribed under rules & regulation for each degree / programme]**

**NATURE OF QUESTION PAPER COMMON MENTIONED SPERATELY:**

**Q. 1 Multiple Choice questions: 8 Marks**

**Q. 2 Answer the following (Any two): 16 Marks**

- a. .
- b.
- c.

**Q.3 Write Short notes on (Any Four): 16 Marks**

- a. .
- b.
- c.
- d.
- e.
- f.

**EQUIVALENCE OF SYLLABUS:**

<b>Old Syllabus Semester Pattern</b>	<b>New Syllabus Semester Pattern</b>
Semester V Paper IX Seed Pathology Paper X Seed Entomology	Semester V Paper IX Seed Pathology Paper X Seed Entomology
Semester VI Paper XI Seed Processing and Storage Paper XII Seed Farm Management And Marketing	Semester VI Paper XI Seed Processing and Storage Paper XII Seed Farm Management and Marketing

**Shivaji University, Kolhapur**  
**B.Sc. Part-III SEED TECHNOLOGY (VOCATIONAL COURSE)**  
**(Implemented from June, 2015)**  
**SEMESTER V**  
**SEED TECHNOLOGY PAPER –IX**  
**SEED PATHOLOGY**

**Unit 1 Seed borne diseases: (10L)**

**Sub-unit 1.1 :** Introduction: Terms- pathology, seed pathology; seed pathogens, seed borne pathogens.

**Sub-unit 1.2 :** History of seed pathology and economic significance of seed borne diseases.

**Sub-unit 1.3 :** Seed borne fungi, bacteria, viruses and nematodes. (Any two examples of each group.)

**Sub-unit 1.4 :** Inoculum density of seed borne pathogens and its relationship with disease

**Sub-unit 1.5 :** Ecological relationship of seed borne micro organisms.

**Unit 2 Seed infection: (10L)**

**Sub-unit 2.1 :** Introduction- concept of infection and seed infection, significance of seed infection.

**Sub-unit 2.2 :** Storage fungi and their impact on animal and human health. (Suitable examples)

**Sub-unit 2.3 :** Mechanisms of transmission of seed pathogen.

**Sub-unit 2.4 :** Entry points of seed infection.

**Sub-unit 2.5 :** Influence of environmental factors on seed borne diseases.

**Sub-unit 2.6 :** Preventive measures of seed pathogen infection.

**Unit 3 Seed treatment: (11L)**

**Sub-unit 3.1 :** Introduction.

**Sub-unit 3.2 :** Aim and objectives of seed treatment in agronomical practices.

**Sub-unit 3.3 :** Seed treatment, procedures and equipments.

**Sub-unit 3.4 :** Objectives of seed health testing, procedures of sampling methods of seed health testing.

**Sub-unit 3.5 :** Recent / modern technologies in seed treatment.

**Unit 4 Seed Legislation: (09L)**

**Sub-unit 4.1 :** Introduction.

**Sub-unit 4.2 :** Quarantine for seed. (Principle and procedure)

**Sub-unit 4.3 :** Seed certification and tolerance limits of seed borne pathogens

**Sub-unit 4.4 :** Seed act in relation to seed borne diseases.

**Sub-unit 4.5 :** Recent developments in seed act.

-----  
**Total Lectures 40**

**SEMESTER V**  
**SEED TECHNOLOGY PAPER –X**  
**SEED ENTOMOLOGY**

**Unit 1 Introduction: (10L)**

**Sub-unit 1.1 :** Concept of Entomology and seed entomology

**Sub-unit 1.2 :** Concepts of insect, insect pest and origin of insect pests.

**Sub-unit 1.3 :** Insect Body-General morphological characters and organization of insect body a) Head, b) Thorax c) Abdomen and Appendages.

**Sub-unit 1.4 :** External morphology and types of appendages.

**Sub-unit 1.5 :** General Models of Life cycles of insect- no metamorphosis, gradual metamorphosis, incomplete metamorphosis and complete metamorphosis.

**Sub-unit 1.6 :** Methods of insect classification, orders of class insect.

**Sub-unit 1.7 :** Economic importance and losses caused by insect pests.

**Unit 2 Seed Insect pests: (10 L)**

Study of following insect pests of seed crops with reference to scientific name, identification marks, nature of damage and management:

**Sub-unit 2.1 :** Sorghum Midge

**Sub-unit 2.2 :** Corn Earworm

**Sub-unit 2.3 :** Gram pod borer

**Sub-unit 2.4 :** Brinjal-fruit borer.

**Sub-unit 2.5 :** Western Conifer Seed Bug (*Leptoglossus occidentalis*).

**Sub-unit 2.6 :** Stored grain pests

- a. Rice weevil (*Sitophilus oryzae*)
- b. Lesser grain borer (*Rhyzopertha dominica*)
- c. Rust-red flour beetle (*Tribolium castaneum*)
- d. Saw-toothed grain beetle (*Oryzaephilus surinamensis*)
- e. Khapra beetle (*Trogoderma granarium*)
- f. Pulse beetle

**Unit 3 Insect pest Management: (10 L)**

**Sub-unit 3.1 :** Methods of insect pest control: cultural, mechanical, physical, chemical, Quarantine, pesticides of plant origin, Autocidal and Biological control. (in brief) Insecticide formulations, and preparation of spray solution, safe application of pesticides.

**Sub-unit 3.2 :** Types of equipments and their principles; safe handling maintenance and use of machines fumigants and methods of fumigation, seed protectants and their impact on seed viability.

**Unit 4 Beneficial insects and Harmful Insects: (10 L)**

**Sub-unit 4.1 :** Concept of Beneficial and harmful insects.

**Sub-unit 4.2 :** Types of insects pollinators and their use in crop pollination.

**Sub-unit 4.3 :** Beneficial insects and their role in seed production (Honey bee and others)

**Sub-unit 4.4 :** Types of insect pests and mites in storage seeds and dry fruits: Nature of damages and losses caused, factors influencing them, sources, development and infestation.

-----  
**Total Lectures 40**

Shivaji University, Kolhapur  
**B.Sc. Part-III -SEED TECHNOLOGY (VOCATIONAL COURSE)**  
**SEMESTER VI**  
**SEED TECHNOLOGY PAPER-XI**  
**SEED PROCESSING AND STORAGE**

**Unit 1 Seed processing: (10 L)**

**Sub-unit 1.1 : Introduction:** Concept and objectives of seed processing: Basic flow pattern in seed processing, concept and importance of seed processing in the pathway of seed improvement, physical characteristics used to separate seeds.

**Sub-unit 1.2 : Preparing seeds for processing:** The scalper, the debearder, the maize scarifier and sheller, licensing of machines.

**Sub-unit 1.3 : Seed drying:** Importance and advantages of seed drying ,moisture content, Orthodox /recalcitrant methods of seed moisture measurements, Theory of seed drying (wet dry seeds),advantages of mechanical drying equipments dehumidification and drying of heat sensitive seeds , relative humidity and equilibrium, moisture content of seeds.

**Unit 2 Seed processing machines: (10 L)**

Principle, construction, working, adjustments, cleaning and uses of seed processing machines viz.

**Sub-unit 2.1 :** Air screen cleaner cum grader.

**Sub-unit 2.2 :** Specific gravity separator, aspirators, pneumatic aspirators, stoner

**Sub-unit 2.3 :** Roll mill

**Sub-unit 2.4 :** Magnetic separators

**Sub-unit 2.5 :** Spiral separators, dropper best separator, electrostatic separators

**Unit 3 Seed treatment and seed processing plants: (10L)**

**Sub-unit 3.1 :** Seed Treatment: Principle, construction, working, adjustments and uses of slurry seed treater mist -o- matic seed treater, storage and labeling of treated seeds, seed users safety.

**Sub-unit 3.2 :** Site selection for seed processing plant on a seed production farm, layout of machines in a seed processing plant for efficient product and man movement, seeds in post harvest phase, conservation of energy and production

**Sub-unit 3.3 :** Seed conveyors and elevators, bucket elevator, belt conveyor, screen conveyor, oscillation conveyor, pneumatic conveyor.

**Unit 4 Seed storage and packing: (10 L)**

**Sub- unit 4.1 :** Seed storage – structures and their management.

**Sub- unit 4.2 :** Packing and marketing of seeds, bagger weigher, bag closing, portable and conveyor type of bag closer, labeling and maintaining lot identify, lot numbers, seed pellets, handling and stacking, maintenance of seed processing record.

-----  
**Total Lectures 40**

Shivaji University, Kolhapur  
**B.Sc. Part-III -SEED TECHNOLOGY (VOCATIONAL COURSE)**  
**SEMESTER VI**

**SEED TECHNOLOGY PAPER-XII**

**SEED FARM MANAGEMENT AND MARKETING**

**Unit I -Farm management** **(10 L)**

**Sub- unit 1.1 :** Scope : Basic principles in farm management, field or farm management, decision making operation & control.

**Sub- unit 1.2 :** Decision making based on production, cost and capital investment, cost analysis Law of diminishing returns, opportunity cost, most profitable combination of input and output.

**Unit II- Field practices and machinery management** **(10 L)**

**Sub-unit 2.1 :** Concepts of various crop production, field practices as tillage, irrigation, sowing, plant protection, harvesting and threshing, maintenance of soil fertility, weeds & their control. Crop rotation, mixed cropping ,multiple cropping &dry land farming.

**Sub-unit 2.2 :** Machinery selection & their management, determination of field capacity & field efficiency.

**Unit III- Farm Resource Management and Analysis** **(10 L)**

**Sub-unit 3.1 :** Farm planning , Construction of in farm buildings, implement shed, strong structures.

**Sub-unit 3.2 :** Farm business analysis, farm size, factors affecting profit and economic size of farm.

**Sub-unit 3.3. :** Farm budgeting procedure and uses, farm efficiency measures, farm records & their uses.

**Sub-unit 3.4. :** Farm surveys, data collection & analysis.

**Sub-unit 3.5. :** Acquisition & management of land labour & capital.

**Unit IV- Seed marketing** **(10 L)**

**Sub-unit 4.1 :** Marketing- Basic concepts, supply & demand, price equilibrium, seed transportation, storage, cost & returns, cost processing, packing and marketing, Organization for seed marketing , seed markets in India, structure & working.

**Sub-unit 4.2 :** Seed market surveys, seed industry in relation to global market, concept of WTO, GATT, IPR, PBR.

-----  
**Total Lectures 40**

Shivaji University, Kolhapur  
**B.Sc. Part-III -SEED TECHNOLOGY (VOCATIONAL COURSE)**  
**PRACTICAL-I**

**Unit I**

1. Demonstration & handling of stereobinocular microscope.
2. Characters of important seed borne pathogens. (Any five)
3. Visual examination of dry seeds for disease symptoms. (Any five).
4. Examination of suspensions obtained from washings of seed.
5. Viability test- space germination test and tetrazolium test.
6. Infection sites studied by planting seed components

**Unit II**

7. & 8. Detection of important seed borne fungi-various detection methods
9. & 10. Detection of important seed bore bacteria- various methods.
11. & 12. Detection of important seed borne viruses-various methods.

**Unit III**

13. & 14. External morphology of insect, type of mouth-parts, antenna & legs.
15. & 16. Identification of important storage and dry fruit pests, and their control.
17. Detection of seed borne insects.

**Unit IV**

18. Fumigation-principle and practical application.
19. & 20. Types of insecticide formulations, their preparation & safe use.
21. Plant protection equipments, their safe handling & use.
22. Collection and submission of stored product pests.
23. Visits to warehouse & godowns and market.



**Shivaji University, Kolhapur**  
**B.Sc. Part-III -SEED TECHNOLOGY (VOCATIONAL COURSE)**  
**PRACTICAL-II**

**Unit I**

1. Study of physical characteristics of different crop seeds & their shapes.
2. Determination of physical properties of seeds of different crops.
3. Measurement of seed moisture content by O S W A & moisture meter / oven drying method in three crops.
4. Measurement of moisture content in seeds of different age in crop plants.

**Unit II**

5. Study of seed –pre-cleaner, maize sheller & dehusker.
6. Study of air screen cleaner cum grader.
7. Study of magnetic separator.
8. Study of specific gravity separator.
9. Study of seed treatment machines.
10. Study of seed packaging equipment
11. Study of bucket elevator, screw conveyers and pneumatic elevators

**Unit III**

12. Study of threshing machine and its use.
13. 13. Determination of water holding capacity /organic content of soil.
14. Soil sampling for fertility & moisture content.

**Unit IV**

15. Study of farm implements viz. Weeders, hoes, harrow
16. Study of Cost analysis in suitable example.
17. Farm planning & budgeting
18. Record keeping
19. Visit to a seed processing & storage complex and familiarization with different machines.

## **Shivaji University, Kolhapur**

### **Reference Books**

1. Acharya S. S. – Agricultural marketing in India.
2. Agarwal V.E. & Sincelair, J.B.-Principles of seed pathology Vol. I & II.
3. Alexopoulos C. J. – Introductory mycology.
4. Atwal A. S. – Agricultural Entomology.
5. Billy R. Gregg, Alvin G. Law, S. S. Virde, J.S. Balis-Seed Processing.
6. Bindra D. S. - Plant Protection and equipments.
7. Carl W. Hall – Drying Farm crops
8. Chakravarty A - Post Harvest Technology & cereals, pulses & oil seeds.
9. Chopra L. - Plant Breeding Field crops Oxford IBH Pvt. Ltd. New Dehli. 2001
10. Chopra V. L. - Plant Breeding Theory and Practices Oxford IBH Pvt. Ltd. 31. V.
11. Free J. B. – Insect pollination of field crops
12. Henderson S. M. & R. Perry –Agricultural process Engineering.
13. Hunt D. – Farm power & machinery management
14. ICAR – Handbook of Agriculture
15. Jeffs K. A. -Seed treatment
16. Johl S. S. & T.R. Kator – Fundamentals of farm management.
17. John E. Kadlec – Farm management, decision operation control.
18. Kahlona A. S. and Karam Singh – Economics of farm management in India
19. Marsh R.W. – Systemic Fungicides R.W. Marsh – Systemic Fungicides
20. Mary Noble & M.J. Richardson – An annotated list of seed borne diseases
21. Metcalf & Flint –Destructive & useful Insects.
22. Michael D. Boehlje & Verman R. Eidman –Farm management
23. Neergaard – Seed Pathology vol. I & II.
24. Nene Y. L. & M.J. Thapliyal –Fungicides in plant disease control.
25. Raju V. T. & D.V. Rao – Economics of Farm production & management
26. Shrivastava J. P. – An Introduction to fungi
27. Singh B. D. - Plant Breeding Principles and Methods. Kalyani Publ. Ludhiana
28. Singh Prem and Arya – Vegetable breeding and seed production. Kalyani Publ. Ludhiana.
29. Singh, B. D. - Plant Breeding 2 ed. 2006. Kalyani publ. Ludhiana.
30. Vyas S. C. –Systematic Fungicides
31. Warren L. Melabe, Julien C. Smith & Peter Harviot – Unit operation in chemical engineering.

## **B. Sc. – III (Seed Technology) Shivaji University, Kolhapur**

### **Practical Examination**

- A.** Each candidate must produce a certificate from the Head of the department in his College, stating that he/she has completed the practical course in a satisfactory manner and has properly maintained the laboratory journal Every candidate must have recorded his/her observations in the laboratory journal and has written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of the teaching staff and certified by the Head of the department at the end of the year. Candidates are to produce their journals at the time of practical examination.
- B.** Excursion and visits to ware houses godowns, markets and study farm Machinery. Study of seed processing with different machines, market survey is necessary. One of the excursions shall be to the Research Institute or Agricultural University engaged in seed Technological studies and research.
- C.** Each practical examination (I&II) shall be of five hours duration & shall test a candidate on two successive days.
- D.** Report of job training or seminar or market survey. Students should visit to seed processing units, various crop fields( maintain field diary) at breeding stations and local market and submit the report of the same at the practical examination. They should be duely signed by the teacher in charge and certified by the Head of the department. The same will be assessed by the job training teacher
- E. Field diary**
- 1) Locality.
  - 2) Crop-Kharip/Rabi, Type-oil seeds /seeds/cereals/pulses, variety sown
  - 3) Soil.
  - 4) Climate
  - 5) Irrigation facilities.
  - 6) Seed rate.
  - 7) Duration
  - 8) Insect pests and their control, success achieved
  - 9) Diseases and their control, success achieved
  - 10) Weeds and their control, success achieved
  - 11) Farm machinery used at various periods.
  - 12) Productivity ( harvesting time )
  - 13) Storage & its management
  - 14) Losses / benefit.

SHIVAJI UNIVERSITY, KOLHAPUR

**B. Sc. III (Seed Technology)**

**B.Sc. III PRATICAL EXAMINATION MARCH/APRIL,2016 onwards**

**SEED TECHNOLOGY: PRACTICAL –I**

**Time:** 11.00 am onwards

**Marks:** 50

***N.B. 1) Draw neat labeled sketches wherever necessary.***

***2) Show your preparations to the examiners.***

Q.1 Find out the average % of diseased seeds/ grains of the given sample A / Prepare slides from the given seed sample A and Identify the causal Organism. (5)

Q. 2 Determine the viability % of the given seed/ grain sample B by using Tetrazolium test, Write in brief the procedure of the test. (5)

Q. 3. Give the classification and description of the specimen C. (5)

Q. 4. Describe the structure and working of the apparatus D. (5)

Q 5 a) Identify and describe E (4)

b) Identify and describe the morphology of F (4)

c) Comment on the specimen G (4)

d) Describe the given specimen H (4)

Q 6 Submission, field diary and viva voce (9)

Q 7 Journal (5)

SHIVAJI UNIVERSITY, KOLHAPUR

**B. Sc. III (Seed Technology)**

**B.Sc. III PRATICAL EXAMINATION MARCH/APRIL,2016 onwards**

**SEED TECHNOLOGY: PRACTICAL –II**

**Time:** 11.00 am onwards

**Marks:** 50

***N.B. 1) Draw neat labeled sketches wherever necessary.***

***2) Show your preparations to the examiners.***

- Q.1 Describe external and internal physical properties of given seed / grain A (5)
- Q. 2. Determine the moisture % of the given seed/ grain sample B. Write in brief the procedure of the test. (5)
- Q. 3. Describe the structure and working of apparatus C. (5)
- Q. 4 Comment on the working and use of the apparatus D. (5)
- Q. 5 a) Identify and describe E. (5)
- b) Identify and describe the morphology of F. (5)
- c) Comment on the specimen G. (5)
- d) Describe the given specimen H. (5)
- Q. 6 Determine WHC/ organic content of soil sample I. (5)
- Q. 7. Prepare a layout plan of a farm by using given data J. (5)

**Or**

- Q. 7. Prepare a farm record by using given data J. (5)
- Q. 8 Report of training /seminar /market survey and viva voce. (10)
- Q. 9. Journal. (5)

SHIVAJI UNIVERSITY, KOLHAPUR  
**B. Sc. – III (Seed Technology)**

**Key to the Practical's**

**PRACTICAL – I**

1. Diseased seeds or their suspension. (5)
2. Viability test / Tetrazolium test. (5)
3. Identification, classification (order ) and description of the insect. (5)
4. Apparatus of plant protection / fumigation. (5)
5. Spotting – a) Seed fungi bacteria, viruses. (16)  
                  b) mouth parts / legs/antenna/metamorphosis stage of an insect.  
                  c) storage pest  
                  d) Bees or Bee box
6. Submission-storage pest, field diary and viva based on these. (09)
7. Journal. (5)

**PRACTICAL-II**

1. Physical properties of crop seeds. (5)
  2. Moisture content of seed /soil. (5)
  3. Apparatus and its use (maize sheller and de-husker Air cleaner & grader). (5)
  4. Machine and its working (bucket elevator /pneumatic elevator). (5)
- OR**
4. Machine and its working ( Seed treatment /packing equipment). (5)
  5. To determine water holding capacity / organic content of soil. (5)
  6. Making a cost analysis / budgeting on basis of a given data. (5)
  7. Making of a farm plan / preparation of farm record on basis of given data. (5)
  8. Report of training, seminar and market survey. (10)
  9. Journal. (5)