Savitribai Phule Pune University, Pune

(Formerly, University of Pune)

Under Graduate Degree Program in Seed Technology

(Faculty of Science & Technology)

Revised Syllabi as per National Education Policy (2020) for

S.Y.B.Sc. Seed Technology (Semester-III and IV)

(For Colleges Affiliated to Savitribai Phule Pune University, Pune)

To be implemented from

Academic Year 2025-2026

Framed by

BOARD OF STUDIES IN BOTANY

Savitribai Phule Pune University,

Ganeshkhind, Pune -07.

(Dr. Mahesh N. Ichhade)
Chairman - BoS Botany

OBJECTIVES

- To promote the possibility of self-employment
- To bridge up the gap between knowledge based conventional education and market demands and to provide an alternative to those pursuing higher education.
- To enrich students' training and knowledge that would be useful in the seed industry so that the farmers will get quality seeds
- To introduce the concepts of experimental design in Seed Technology
- To inculcate sense of job responsibilities, while maintaining social and environment awareness
- To help students build-up a progressive and successful career in industries with a biotechnological perspective

According to NEP-2020 criteria, the under graduate degree in Botany (S.Y.B.Sc. Seed Technology) program at Savitribai Phule Pune University associated colleges, is structured to provide students with advanced field-related knowledge and essential fundamentals. Through a unique combination of required major core courses with in-depth exposure to multidisciplinary minor, elective, and vocational skill courses, among other courses, students will be trained and acquire the fundamental and advanced knowledge essential to the industries.

With the knowledge gained in the field of seed technology, this upgraded curriculum will develop educated, outcome-oriented candidates who are nurtured through discovery and learning, equipped with practice and skills to deal with practical problems, and competent with recent pedagogical trends in education, including E-learning, flipped class, hybrid learning, and experiential learning. These candidates will become responsible citizens, transforming the nation to lead the world in the future.

After successful completion of the Under Graduate (UG) Degree program, following POs, PSOs, COs, will be acquired by the students

PROGRAM OUTCOMES (POS)

- **PO1:** Attain thoughtful proficiency in the field of seed sciences.
- **PO2:** Acquire the ability to perform in multidisciplinary domains.
- **PO3:** Attain the ability to exercise intelligence of scientific knowledge for investigation and innovation and nourishment of the world.
- **PO4:** Learn value based ethical practices and principles committed to professional ethics.
- **PO5:** Incorporate 21st century skill oriented self-directed and life-long learning.
- **PO6:** Obtain ability to inculcate the knowledge of seed science in diverse contexts with global perspective.
- **PO7:** Attain maturity to harness the destiny and responds to one's calling.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1:** Recall the diversity, classification, evolution and developmental changes among the plants with reference to lower and higher plant groups and create a knowledge base in understanding the basis of Seed Science and Technology.
- **PSO2:** Understand the advanced concepts of Seed Science and Technology and its implementation for the improvement of crop productivity.
- **PSO3:** Acquire and utilize the skills of post-harvest, flower design, fruit processing and dehydration techniques, organic farming and various plant processing technologies for developing the economy to the growing world.
- **PSO4:** Know about the importance of seeds and its relevance in modern agriculture.

- **PSO5:** Adapt methods of scientific research in plant improvement program and create entrepreneurships, employment to the society.
- **PSO6:** Enrich the ability of critical thinking, development of scientific attitude, handling of problems and generating solutions, improve practical skills, and enhance communication skill.
- **PSO7:** Apply the fruitful knowledge of seed sciences and plant resources for the sustainable development, betterment of society and environment by recognizing the ethical values.
- **PSO8:** Demonstrate knowledge and scientific understanding to identify research problems, design experiments, use appropriate methodologies, analyze and interpret data and provide solutions. Exhibit organizational skills and the ability to manage time and resources.

1. **Title of the Course: B.Sc. Seed Technology (03 years) / B.Sc. with Honours in Seed Technology (04 years)** Syllabus revised as per National Education Policy (NEP) 2020 for the Colleges Affiliated to Savitribai Phule Pune University, Pune
2. **Faculty - Science and Technology**
3. **To be implemented -**For SYBSc (Semester III and Semester IV), from August 2025.
4. **Preamble:**

Vocational Seed Technology is a three year degree course approved by Savitribai Phule Pune University taught at undergraduate level since 1995 under the Vocationalisation of first degree education scheme sanctioned by UGC. The course "Seed Technology" was introduced in 1995 only at Pravara Rural Education Society's Padmashri Vikhe Patil College of Arts, Science and Commerce, Pravaranagar and has fetched employment to most of the students in reputed seed industries. The course is coordinated and conducted by the Department of Botany of the college.

Seed Technology is a science dealing with the methods of improving genetic and physical characteristics of seed. Study of seed technology is necessary for two reasons. Firstly, the introduction of hybrids and high yielding varieties of crop plants of immense importance has necessitated great care in the maintenance and preservation of seed. Secondly, if seed production is to evolve as a prime enterprise, instead of a byproduct as it has been characteristically handled down through the centuries. Development of seed enterprise is absolutely necessary in the context of modern agriculture. It is the quickest way of increasing agricultural production. Much of our success in increasing food production has been due to the development of seed enterprise over the past decade. Seed demand at present is strong and expected to continue expanding.

Indian economy depends on agriculture and about 60 % of Indian population depends on agriculture. For quality production the farmers need quality seeds or propagating materials. Unless the farmer gets seeds, which are genetically pure and possess other desired qualities namely, high germination percentage and vigour, high purity, sound health etc. they cannot obtain the expected yields.

Quality material is provided to the farmers by the seed industries established throughout the country. These industries are in continuous demand for the knowledgeable, trained, talented Seed Technologists. These industries provide career opportunities to the graduate and post graduate students in the following ways:

- Management of seed enterprise (Govt./Semi govt. undertakings and private seed companies)
- State and Central Seed Testing Laboratories
- Seed Certification Agencies
- Seed Law Enforcement Agencies
- Training/Extension Centers

- Research Institutes

The course focuses on training of students in plant breeding, tissue culture, seed health testing techniques, testing for purity of seeds, crop improvement, protection and storage techniques. Seed technology is of prime importance because

- Seed is a carrier of new technologies
- Seed is a basic tool for secured food supply
- Seed is the principal means to secure crop yields in less favorable production areas
- Seed is a medium for rapid rehabilitation of agriculture in cases of natural disaster

The proposed syllabus lays more stress on practical's as compared to theory. It concentrates on experimental practice and theoretical aspects. This approach justifies the term 'vocational'.

The teaching center will develop trained manpower for the industries and employments will be generated. Students can also become entrepreneurs. Trained and competent teachers with experience in industry would be ideal to teach the subject. Besides such teachers, persons from industry could contribute to the course.

Program Duration and Exit Options

The UG Program lasts for four years or eight semesters. Student may leave the program after the third year if, he/she would like to receive a three year undergraduate degree. If the student decides to withdraw after the first or second year, he/she will receive a UG Certificate or UG Diploma, depending on how many credits he/she is able to complete. Re-entering within three years to finish the degree program is allowed for students who leave with a UG certificate or UG diploma. A student must earn a minimum of 18 credits and a maximum of 26 credits each semester. It is recommended, nevertheless, that student should opt 22 credits per semester. This clause aims to give student the comfort of a flexible semester-based course load. However, Table 1 lists the minimum number of credits required to be earned in order to be awarded an Undergraduate Certificate/Undergraduate Diploma/Bachelor Degree/Bachelor's Degree with Honors in Botany.

Table1: Type of Awards and Stages of Exit

Sr. No.	Type of Award	Stage of Exit	Mandatory Credits
1.	Undergraduate Certificate in Seed Technology	After successful completion of First year Semesters	44
2.	Undergraduate Diploma in Seed Technology	After successful completion of Second year Semesters	88
3.	Bachelor of Science in Seed Technology	After successful completion of Third year Semesters	132
4.	Bachelor of Science in Seed Technology (Honours)	After successful completion of Fourth year Semesters	176

5. Eligibility Criteria -

The basic criteria for Under Graduate Degree (FYBSc Seed Technology) admission will be 10+2 criteria with Biology, Physics, Chemistry, as Principal subjects OR Crop Science, Animal Science, Dairy Science, MCVC, Crop Production OR Diploma courses related to Plant Sciences. Admissions will be given as per the selection procedure / policies

adopted by the college keeping in accordance with the conditions laid down by the Savitribai Phule Pune University, Pune. Reservation and relaxation are as per the State Government rules. Students qualified in FYBSc Seed Technology as per the norms of SPPU will continue their education for SYBSc Seed Technology course.

6. **Fee Structure –** As per the norms of Savitribai Phule Pune University, Pune.

7. **Duration of the Course**
   Certificate Course- 01 year (Completion of 02 Semesters)
   Diploma Course- 02 years (Completion of 04 Semesters)
   BSc Degree- 03 years (Completion of 06 Semesters)
   BSc Degree with Honours- 04 years (Completion of 08 Semesters)

8. **No. of semesters –** Two semesters per year

9. **Medium of instructions and teaching:** English

10. **Course Implementation criteria for Theory, Practical, Field Project/Community Engagement Program:**
    a. Each semester comprises of 15 weeks (12 weeks Actual Teaching + 3 weeks for Continuous Internal Evaluation).
    b. **One Credit of the Theory** is equal to 15 clock hours (Teaching 1 hour per week for each credit, 12 hours Actual Teaching + 3 hours Continuous Internal Evaluation – Assignments, Tutorials, Practice, Problem solving sessions, Group discussion, Seminars and Unit Tests.
    c. **One Credit of Practical** is equal to 30 clock hours. (2 Contact hours per credit per week) One Credit = 30 clock hours (24 hours' Actual Table work + 6 hours for journal competition, and Continuous Internal Evaluation of each practical).
    d. **Practical for each course comprises of 02 Credits = 60 clock hours.** Therefore,
    - Minimum 12 laboratory sessions of 04 clock hours must be conducted in one semester.
    - In case of short practical, two practical's should be conducted in one session.
    - Each practical of 04 clock hours in the laboratory should consist of: Table performance for concerned practical, careful observations, calculation, writing results and conclusion, and submission of practical in written form.
    - Pre-laboratory reading and post laboratory assignments should be given on each practical as a part of continuous internal evaluation.

    e. **Field Project (FP): 02 credits** (60 hours including field study, labwork, presentations, assignments etc.)
    f. **Community Engagement Program (CEP): 02 Credits** (60 hours including community engagement activities, labwork, presentations, assignments etc.)

11. **Examination Pattern (For each Semester):** The examinations will be conducted semester wise for both Theory, Practical and Field projects/Community Engagement Programs.
    - **Theory Paper of 02 Credits –**
      Internal Exam (15 M) + University Theory Exam (35 M) = Total 50 M
      Duration: For Internal exam = 40 Min. and For University Exam = 02 hours.

- **Practical Paper of 2 Credits –**
  Internal Exam (15 M) + University Practical Exam (35 M) = Total 50 M
  Duration: For Internal exam = 40 Min. and For University Exam = More than 04 hours.
- **Field Project: 02 credits**
  Student field project should be evaluated for total 50 marks (15 marks for internal and 35 marks for external evaluation). During internal assessment following points should be considered
  1. Appropriateness of the field project
  2. Punctuality of the student
  3. Field work
  4. Field diary
  5. Viva voce

  The criteria for external evaluation should be
  1. Originality and significance of the project, its relevance to the field, and potential impact.
  2. Soundness of methodology, research design, and approach.
  3. Quality, accuracy, and thoroughness of data collection, analysis, and interpretation.
  4. Validity and significance of findings, conclusions, and recommendations.
  5. Clarity, organization, and effectiveness of the project report and presentation.
- **Community Engagement Program (CEP): 02 Credits**
  Student Community Engagement Program (CEP) shall be evaluated for total 50 marks (15 marks for internal and 35 marks for external evaluation). During internal assessment following points shall be considered
  1. Effectiveness of program design and planning.
  2. Student participation and engagement in program activities.
  3. Effectiveness of student communication with community members.
  4. Demonstration of seed technology knowledge and skills.
  5. Maintenance of program records and documentation.

  The criteria for external evaluation shall be
  1. Clarity, organization, and effectiveness of the report and presentation.
  2. Assessment of the program's impact on the local community.
  3. Evaluation of student learning outcomes and skills development.
  4. Assessment of the program's effectiveness in achieving its objectives.

12. Award of Class/Grade: The class / grade for the courses of each semester will be followed as per the norms and conditions laid down by SPPU, Pune.

13. ATKT Rules: As per the norms given by SPPU, Pune.

14. Important Note:

a. There shall be at least a short tour/field visit/industrial visit (1-2 days) per year for all UG students.

b. Tours are the part of curriculum and obligatory to each student, failing which they will not be considered eligible to appear for the practical examination. Under unavoidable circumstances, if the student fails to attend the tour, he/she have to produce justifiable evidence for not attending the tour. However, in lieu of tour the candidate will have to complete the work assigned by the Department.

c. The documents to be produced by each student at the time of practical examination (at the end of each Semester) are:

- Submission of practical records (Journals).
- Submission of a Tour / Visit report duly signed by the concerned practical Incharge and Head of the Department.
- Any submissions / assignments, etc. based on the practical course.

15. Question paper pattern for Theory (2 Credit courses)

A student will have to solve the question paper of 35 marks for external exam. The paper setter should set the paper on entire syllabus, including optional questions. As the course is of 2 Credits (30 clock hour lectures), paper setter should allot 2.03 marks per lecture and accordingly, questions should be set for 30 lectures, 61 marks on entire syllabus.

- ***Note: All questions are compulsory.***
- ***Time: 2 Hours***

Que. 1) Answer any five of the following in one sentence 05 Marks

i.
ii.
iii.
iv.
v.
vi.

Que. 2a) Write any one of the following 06 Marks

i.
ii.

Que. 2b) Write any one of the following 04 Marks

i.
ii.

Que. 3a) Solve any one of the following 06 Marks

i.
ii.

Que. 3b) Solve any one of the following 04 Marks

i.
ii.

Que. 4) Write notes on (Any four) 10 Marks

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

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CREDIT FRAMEWORK FOR SYBSc SEED TECHNOLOGY, SEMESTER–III (Level 5.0 / 200)

COURSE DETAILS	COURSE CODE	COURSE TITLE	CREDITS
Vertical – 1 (V1)			
Major Core Courses – (2T + 1P) x 2C = 6C	ST-201-MJ	Morphology and Seed Development	**2 C**
	ST-202-MJ	Principles of Seed Production	**2 C**
	ST-203-MJP	Practical Based on ST-201-MJ & ST-202-MJ	**2 C**
Major Elective Courses - (0C)	-----	------	**0 C**
Vertical – 2 (V2)			
Minor Courses – (1T + 1P) x2C = 4C (Any one from basket)	ST-241-MN	Morphology and Seed Development	**2 C**
	ST-242-MN	Principles of Seed Production	
	ST-243-MNP	Practical Based on ST-241-MN	**2C**
	ST-244-MNP	Practical Based on ST-242-MN	
Vertical – 3 (V3)			
Generic Elective (GE) / Open Elective (OE) - (1T = 2C) (Any one from basket)	OE-201-ST-T	Landscape Gardening	**2 C**
	OE-202-ST-T	Organic Farming	
	OE-203-ST-T	Modern Irrigation Techniques	
Vertical – 4 (V4)			
Vocational Skill Courses (VSC) – (1T /P = 2C) (Any one from basket)	VSC-221-ST-T	Digital Herbaria	**2 C**
	VSC-222-ST-T	Modern Irrigation Techniques	
	VSC-223-ST-T	Weed and its Management	
SEC – (0C)	------	------	**0 C**
Vertical – 5 (V5)			
IKS – (1T=2C)	IKS-ST-T	Medicinal Plants in Traditional Systems of Medicine	**2 C**
Ability Enhancement Courses (AEC) – (1T = 2C)	AEC-201-MAR/HIN	Marathi / Hindi	**2 C**
VEC – (0C)	-------	-------	**0 C**
Vertical – 6 (V6)			
FP – (2C)	FP-231-ST	Field Project	**2 C**
Co-curricular Courses (CC) – (1T = 2C)	CC-201-T	Any one from the basket provided by SPPU	**2 C**
		Total Credits (V1+V2+V3+V4+V5+V6)	**22 C**

S. Y. B. Sc. Seed Technology [Semester - III]

Course Category - Major Core Course

Course Code – ST-201-MJ

Course Title: Morphology and Seed Development

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

1: To understand the concept of Seed Development.
2: To understand the Anthesis and Embryogenesis
3: To understand the role of apomixis and parthenogenesis
4: To gain the knowledge regarding embryo and endosperm development
5: To learn the concept of synthetic seed

Course Outcomes:

1: Students will be acquainted with the concept of seed development.
2: They will understand the basic concept of Anthesis and Embryogenesis
3: Students will understand role of apomixis and parthenogenesis
4: They'll gain the knowledge regarding basic principles in embryo and endosperm development
5: They'll learn synthetic seed production

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction** • Definition, importance and scope of seed morphology • Overview of seed structure w.r.t. embryo, endosperm and seed coat • Seed as a basic input in agriculture	**3L**
2.	**Chapter-2: Morphology of Field Crops and Anthesis** • Morphology of field crops w.r.t stem, leaf, flower, fruit and seed for varietal identification in seed production program- Maize, Wheat, Cotton, Soyabean, Tomato • Anthesis: Definition and Importance • Environmental Factors Affecting Anthesis • Anthesis and Plant Breeding Applications	**3L**
3.	**Chapter-3: Seed Coat Morphology** • Seed Coat structure • Seed coat types-smooth, ribbed and winged • Seed coat function • Seed coat adaptation for different environments including desiccation, tolerance, and water impermeability	**3L**
4.	**Chapter-4: Over View of seed Development** • Definition • Stages of seed development-Pollination, Fertilization, Embryogenesis, Seed Coat formation, Endosperm development and Maturation • Importance of seed development	**3L**
5.	**Chapter-5: Apomixis** • Definition and Concept • Types of apomixis	**3L**

	• Mechanism of apomixis • Advantages and Applications of apomixis • Challenges and limitations of apomixis	
	Credit-II	**15L**
6.	**Chapter-6: Parthenogenesis** • Definition-Parthenocarpy • Natural and Induced parthenogenesis • Embryo abortion in seed • Role of parthenogenesis in agriculture	**3L**
7.	**Chapter-7: Embryo Development** • Definition • Structure of embryo • Types of monocot and dicot embryo • Development of embryo • Adaptations of embryo for different environments	**3L**
8.	**Chapter-8: Endosperm Development** • Definition • Structure of endosperm • Types of endosperm- Nuclear, Cellular and Helobial • Development of Endosperm • Functions of endosperm	**3L**
9.	**Chapter-9: Polyembryony** • Definition and concept • Types-Natural and Induced Polyembryony • Applications	**3L**
10.	**Chapter-10: Synthetic Seed** • Definition and concept • Somatic Embryogenesis • Encapsulation Techniques • Synthetic Seed Technology • Applications of Synthetic Seeds • Challenges and Limitations	**3L**

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Plant breeding-B.D Singh, *Kalyani Publishers, New Delhi*
- Essentials of Plant Breeding- Phundan Singh, 2008
- Experimental Seed Science and Technology -Umaraniet. *al.* 2006., *Agrobios, Jodhpur*
- Plant Breeding: Principles and Methods- Phundan Singh, 2009. *Kalyani Publishers, New Delhi*
- Seed Technology- Agrawal, 2005. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Principles of crop production-Reddy, 2008. *Kalyani Publishers, New Delhi*
- Seed Technology-Harpal Singh Tomar,
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category - Major Core Course
Course Code – ST-202-MJ
Course Title: Principles of Seed Production

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:
1: To understand the basic difference between monocot and Dicot seed.
2: To understand the basic parameters of good quality seed
3: To understand the process of release of a new variety
4: To gain the knowledge regarding steps in seed production and marketing
5: To learn seed testing and processing techniques
6: To know seed storage constraints, pathogens and pest affecting the same.

Course Outcomes:
1: Students will be acquainted with the basic difference between monocot and Dicot seed.
2: They will understand the basic parameters of good quality seed
3: Students will understand the process of release of a new variety
4: They'll gain the knowledge regarding steps in seed production and marketing
5: They'll learn to apply seed testing and processing techniques
6: Students will get aware regarding seed storage constraints, pathogens and pest affecting the same.

Sr. No.	Topic Details	No. of Lectures
	Credit I	**15L**
1.	**Chapter-1: Introduction to Seed Production** • Definition and concept • Seed Village Concept • Importance of quality seeds • Challenges in seed production • Overview of different seed production systems, including breeder seed, foundation seed, and certified seed production	**2L**
2.	**Chapter-2: Seed Quality Testing** • Definition-Seed Quality and concept • Physical and genetic parameters of seed quality, including genetic and physical purity, moisture, germination, seed health and vigor • Principles and procedures of seed certification, including field inspection and seed sampling	**3L**
3.	**Chapter-3: Seed Production Techniques:** • Location and Season • Land requirement and preparation • Seed Source • Sowing: Definition, Time of sowing, Calculation for seed rate, Methods of sowing: Direct: Hand broad casting, Dibbling, Drilling, Indirect: Transplanting • Spacing: Plant to plant and Row to Row	**5L**

	• Importance of soil and water testing • Cultural practices- Plant protection and weed control • Isolation distance • Rouging • Harvesting • Threshing	
4.	**Chapter-4: Irrigation and Drainage** • Definition • Methods of irrigation • Sources of irrigation • Loss due to excess irrigation • Importance of drainage	**2L**

5.	**Chapter-5: Release of new Variety**
	• Introduction
	• Evaluation
	  ○ Station trail
	  ○ Multilocation trail
	  ○ Disease and insect pest
	  ○ Quality test
	• Identification of entries for release
	• Release of a variety
		3L

	Credit-II	**15L**
6.	**Chapter-6: Genetic Purity and its Maintenance** • Definition • Steps for maintenance of genetic purity • Checking seed source • Isolation distance and Roughing • Precaution during crossing program • Care during harvesting and threshing	**3L**
7.	**Chapter-7: Seed Processing components** • Definition and concept of seed processing • Various steps in seed processing • Receiving of seed lot • Seed Conditioning • Seed Drying • Seed Cleaning • Seed grading • Seed Treatment- methods: Disinfection and disinfestation; seed treating equipment's	**5L**
8.	**Chapter-8: Seed Storage** • Definition and need • Stages of seed storage • Containers and packing material • Factors affecting seed storage • Methods of controlling seed damage during storage	**3L**
9.	**Chapter-9: Seed Marketing** • Introduction • Major components of seed marketing • Role of different organizations in seed marketing	**2L**
10.	**Chapter-10: Seed Production Challenges and Opportunities**	**2L**

	• Climate Change and Seed Production • Pests and Diseases • Seed Production and Food Security: • Future Trends in Seed Production: Emerging trends and technologies in seed production, including precision agriculture and biotechnology	

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Experimental Seed Science and Technology -Umarani*et.al.* 2006., *Agrobios, Jodhpur*
- Seed Technology- Agrawal, 2005. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Seed Technology-Harpal Singh Tomar,
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category - Major Core Course (MJ)
Course Code – ST-203-MJP
Course Title: PRACTICAL BASED ON ST-201-MJ and ST-202-MJ

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To identify and describe the morphological characteristics of field crops
2. To know the difference between monocot and dicot seeds
3. To understand the process of synthetic seed production and its potential applications.
4. To calculate of seed rate required for sowing and NPK dose
5. To understand importance of soil testing in agriculture

Course Outcomes:

Upon completion of this course the students will be able to

1. Identify and describe the morphological characteristics of field crops
2. Know the difference between monocot and dicot seeds
3. Understand the process of synthetic seed production and its potential applications.
4. They will be able to calculate of seed rate required for sowing and NPK dose
5. Understand importance of soil testing in agriculture

Sr. No.	Practical	Weightage
1.	Understand and record the anthesis stage in plants	1P
2.	Observe and study monocot seed structure w.r.t seed coat, embryo and endosperm (Maize and Wheat)	1P
3.	Observe and study dicot seed structure w.r.t seed coat, embryo and endosperm (Chickpea and Cotton)	1P
4.	Observe and understand the morphology of field crops w.r.t stem, leaf, flower, fruit and seed for varietal identification in seed production program- Maize/Wheat	1P
5.	Observe and understand the morphology of field crops w.r.t stem, leaf, flower, fruit and seed for varietal identification in seed production program- Cotton/Tomato	1P
6.	Determine the seed with cracked seed coat in the seed lot	1P
7.	Understand the process of synthetic seed production and its potential applications.	1P
8.	Study different methods of seed sowing with suitable examples	1P
9.	Calculate of seed rate required for sowing with suitable examples (Cotton, Maize/ Soyabean, Wheat /Ground Nut, Sorghum)	1P
10.	Seed Dressing: An Effective Seed Treatment Method	1P
11.	Calculate NPK dose for seed production of any suitable crop	1P
12.	Understand seed tags- breeder, foundation, certified and truthful	1P
13.	Test the water quality w.r.t pH, Turbidity and TDS	1P
14.	Understand soil testing for sustainable agriculture	1P
15.	Demonstration of various irrigation methods- Flood, Drip, Sprinkler, micro-sprinklers, Rain gun, Subsurface	1P

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S. Y. B. Sc. Seed Technology [Semester - III]

Course Category - Minor Core Course

Course Code – ST-241-MN

Course Title: Morphology and Seed Development

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

1: To understand the concept of Seed Development.
2: To understand the Anthesis and Embryogenesis
3: To understand the role of apomixis and parthenogenesis
4: To gain the knowledge regarding embryo and endosperm development
5: To learn the concept of synthetic seed

Course Outcomes:

1: Students will be acquainted with the concept of seed development.
2: They will understand the basic concept of Anthesis and Embryogenesis
3: Students will understand role of apomixis and parthenogenesis
4: They'll gain the knowledge regarding basic principles in embryo and endosperm development
5: They'll learn synthetic seed production

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction** • Definition, importance and scope of seed morphology • Overview of seed structure w.r.t. embryo, endosperm and seed coat • Seed as a basic input in agriculture	**3L**
2.	**Chapter-2: Morphology of Field Crops and Anthesis** • Morphology of field crops w.r.t stem, leaf, flower, fruit and seed for varietal identification in seed production program- Maize, Wheat, Cotton, Soyabean, Tomato • Anthesis: Definition and Importance • Environmental Factors Affecting Anthesis • Anthesis and Plant Breeding Applications	**3L**
3.	**Chapter-3: Seed Coat Morphology** • Seed Coat structure • Seed coat types-smooth, ribbed and winged • Seed coat function • Seed coat adaptation for different environments including desiccation, tolerance, and water impermeability	**3L**
4.	**Chapter-4: Over View of seed Development** • Definition • Stages of seed development-Pollination, Fertilization, Embryogenesis, Seed Coat formation, Endosperm development and Maturation • Importance of seed development	**3L**
5.	**Chapter-5: Apomixis** • Definition and Concept	**3L**

	• Types of apomixis • Mechanism of apomixis • Advantages and Applications of apomixis • Challenges and limitations of apomixis	
	Credit-II	**15L**
6.	**Chapter-6: Parthenogenesis** • Definition-Parthenocarpy • Natural and Induced parthenogenesis • Embryo abortion in seed • Role of parthenogenesis in agriculture	**3L**
7.	**Chapter-7: Embryo Development** • Definition • Structure of embryo • Types of monocot and dicot embryo • Development of embryo • Adaptations of embryo for different environments	**3L**
8.	**Chapter-8: Endosperm Development** • Definition • Structure of endosperm • Types of endosperm- Nuclear, Cellular and Helobial • Development of Endosperm • Functions of endosperm	**3L**
9.	**Chapter-9: Polyembryony** • Definition and concept • Types-Natural and Induced Polyembryony • Applications	**3L**
10.	**Chapter-10: Synthetic Seed** • Definition and concept • Somatic Embryogenesis • Encapsulation Techniques • Synthetic Seed Technology • Applications of Synthetic Seeds • Challenges and Limitations	**3L**

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Plant breeding-B.D Singh, *Kalyani Publishers, New Delhi*
- Essentials of Plant Breeding- Phundan Singh, 2008
- Experimental Seed Science and Technology -Umaraniet. *al.* 2006., *Agrobios, Jodhpur*
- Plant Breeding: Principles and Methods- Phundan Singh, 2009. *Kalyani Publishers, New Delhi*
- Seed Technology- Agrawal, 2005. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Principles of crop production-Reddy, 2008. *Kalyani Publishers, New Delhi*
- Seed Technology-Harpal Singh Tomar,
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers

S. Y. B. Sc. Seed Technology [Semester - III]

Course Category - Minor Core Course

Course Code – ST-242-MN

Course Title: Principles of Seed Production

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

1: To understand the basic difference between monocot and Dicot seed.
2: To understand the basic parameters of good quality seed
3: To understand the process of release of a new variety
4: To gain the knowledge regarding steps in seed production and marketing
5: To learn seed testing and processing techniques
6: To know seed storage constraints, pathogens and pest affecting the same.

Course Outcomes:

1: Students will be acquainted with the basic difference between monocot and Dicot seed.
2: They will understand the basic parameters of good quality seed
3: Students will understand the process of release of a new variety
4: They'll gain the knowledge regarding steps in seed production and marketing
5: They'll learn to apply seed testing and processing techniques
6: Students will get aware regarding seed storage constraints, pathogens and pest affecting the same.

Sr. No.	Topic Details	No. of Lectures
	Credit I	**15L**
1.	**Chapter-1: Introduction to Seed Production** • Definition and concept • Seed Village Concept • Importance of quality seeds • Challenges in seed production • Overview of different seed production systems, including breeder seed, foundation seed, and certified seed production	**2L**
2.	**Chapter-2: Seed Quality Testing** • Definition-Seed Quality and concept • Physical and genetic parameters of seed quality, including genetic and physical purity, moisture, germination, seed health and vigor • Principles and procedures of seed certification, including field inspection and seed sampling	**3L**
3.	**Chapter-3: Seed Production Techniques:** • Location and Season • Land requirement and preparation • Seed Source • Sowing: Definition, Time of sowing, Calculation for seed rate, Methods of sowing: Direct: Hand broad casting, Dibbling, Drilling, Indirect: Transplanting • Spacing: Plant to plant and Row to Row	**5L**

	• Importance of soil and water testing • Cultural practices- Plant protection and weed control • Isolation distance • Rouging • Harvesting • Threshing	
4.	**Chapter-4: Irrigation and Drainage** • Definition • Methods of irrigation • Sources of irrigation • Loss due to excess irrigation • Importance of drainage	**2L**

5.	**Chapter-5: Release of new Variety**
	• Introduction
	• Evaluation
	  ○ Station trail
	  ○ Multilocation trail
	  ○ Disease and insect pest
	  ○ Quality test
	• Identification of entries for release
	• Release of a variety
		3L

	Credit-II	**15L**
6.	**Chapter-6: Genetic Purity and its Maintenance** • Definition • Steps for maintenance of genetic purity • Checking seed source • Isolation distance and Roughing • Precaution during crossing program • Care during harvesting and threshing	**3L**
7.	**Chapter-7: Seed Processing components** • Definition and concept of seed processing • Various steps in seed processing • Receiving of seed lot • Seed Conditioning • Seed Drying • Seed Cleaning • Seed grading • Seed Treatment- methods: Disinfection and disinfestation; seed treating equipment's	**5L**
8.	**Chapter-8: Seed Storage** • Definition and need • Stages of seed storage • Containers and packing material • Factors affecting seed storage • Methods of controlling seed damage during storage	**3L**
9.	**Chapter-9: Seed Marketing** • Introduction • Major components of seed marketing • Role of different organizations in seed marketing	**2L**
10.	**Chapter-10: Seed Production Challenges and Opportunities**	**2L**

	• Climate Change and Seed Production • Pests and Diseases • Seed Production and Food Security: • Future Trends in Seed Production: Emerging trends and technologies in seed production, including precision agriculture and biotechnology	

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Experimental Seed Science and Technology -Umarani*et.al.* 2006., *Agrobios, Jodhpur*
- Seed Technology- Agrawal, 2005. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Seed Technology-Harpal Singh Tomar,
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category - Minor Core Course
Course Code – ST-243-MNP
Course Title: PRACTICAL BASED ON ST-241-MN

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To understand the concept of anthesis, structure of monocot and dicot embryo and types of endosperms
2. To understand the structure of monocot and dicot seeds and morphology of field crops
3. To understand the process of synthetic seed production

Course Outcomes:

1. Students will be acquainted with the concept of anthesis, structure of monocot and dicot embryo and types of endosperms
2. They will understand the structure of monocot and dicot seeds and morphology of field crops
3. They will understand the process of synthetic seed production

Sr. No.	Practical	Weightage
1.	To observe and record the anthesis stage in plants	1P
2.	To observe and compare structure of embryo in monocot and dicot seeds	1P
3.	To observe and study types of endosperms- Nuclear, Cellular and Helobial	1P
4.	To observe and study monocot seed structure-Maize and Wheat	2P
5.	To observe and study dicot seed structure-Chickpea and Cotton	2P
6.	To observe and understand the morphology of field crops w.r.t stem, leaf, flower, fruit and seed for varietal identification in seed production program- Maize and Wheat	2P
7.	To observe and understand the morphology of field crops w.r.t stem, leaf, flower, fruit and seed for varietal identification in seed production program- Cotton and Tomato	2P
8.	To determine the seed with cracked seed coat in the seed lot	1P
9.	To understand the process of synthetic seed production and its potential applications.	1P
10.	Submission of any 10 seed samples of crop plants	2P

S. Y. B. Sc. Seed Technology [Semester - III]

Course Category - Minor Core Course

Course Code – ST-244-MNP

Course Title: PRACTICAL BASED ON ST-242-MN

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To understand the different methods of seed sowing
2. To understand the raising of vegetable seedlings in nurseries
3. To understand the calculation of seed rate
4. To understand importance of soil testing in agriculture

Course Outcomes:

1. Students will be familiar with different methods of seed sowing
2. They will understand the raising of vegetable seedlings in nurseries
3. The will understand the calculation of seed rate and importance of soil testing in agriculture

Sr. No.	Practical	Weightage
1.	To study different methods of seed sowing (Hand Broadcasting and Dibbling) with suitable examples	1P
2.	To study the raising of vegetable seedlings by using raised nursery bed	2P
3.	To study the raising of vegetable seedlings by using flat nursery bed	2P
4.	To study the calculation of seed rate required for sowing with suitable examples (Maize, Wheat, Sorghum)	1P
5.	To study the calculation of seed rate required for sowing with suitable examples (Cotton, Soyabean, Ground Nut)	1P
6.	To study seed treatment method-Seed dressing	1P
7.	To test the water quality w.r.t pH, Turbidity and TDS	1P
8.	To understand soil testing for sustainable agriculture	1P
9.	To understand the calculation of NPK dose for seed production in any suitable crop	1P
10.	To understand seed tags- breeder, foundation, certified and truthful	1P
11.	To know different storage containers and packing material	1P
12.	Demonstration of various irrigation methods- Flood, Drip, Sprinkler, micro-sprinklers, Rain gun, Subsurface	1P
13.	Visit to any nearby seed industry and report writing	1P

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S. Y. B. Sc. Seed Technology [Semester - III]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code –OE-201-ST-T

Course Title: Landscape Gardening

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objective

- To develop skills in landscape planning.
- To allow them to utilize available land effectively.
- To increase students' knowledge about the maintenance of plants and home gardens.
- To gain insight into various decorative features of the garden.

Course Outcomes:

- Students will understand the fundamentals of Landscaping and Planning
- They will understand the appropriate selection and use of plants for Landscaping
- They know to use proper designs and to incorporate various garden features
- They'll get the knowledge to maintain and care for plants effectively
- They acquire entrepreneurial skills

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction** • Definition and concept • Importance and objectives of Landscaping • Principles of landscape gardening • Factors affecting landscape planning • Types of Landscape gardens: Formal and informal	5L

2.	**Chapter-2: Garden Design and Planning:**
	• Concept for creating garden designs and plans
	• Design and planning tools: Graph paper, pencils and markers, measuring tape, camera and design software
	• Site analysis
	• Light and colour in the garden
	• Other garden features
	  ○ Landscape paths
	  ○ Rock garden
	  ○ Water garden
	  ○ Miniature garden
	  ○ Terrarium
	  ○ Green house
		7L

3.	**Chapter-3: Plant Selection for Landscape:** • Learning about different types of plants • Characteristics for selection of plants for specific landscapes.	3L
	Credit-II	**15L**
4.	**Chapter-4: Tools in Landscape Gardening** • Hand tools: Trowels, pruning shears, garden forks, rakes, hoese • Power tools: Lawn mowers, hedge trimmer, chain saws, string trimmers, leaf blowers	5L
5.	**Chapter-5: Plant Care and Maintenance of surroundings** • Concept and need	5L

	• Plant care techniques: Pruning and training, Irrigation, Fertigation, Weed management, Plant protection, Seasonal maintenance tasks	
6.	**Chapter-6: Management of Common Pest and diseases in landscape Gardening:** • Insect pest: Aphids, White flies, Caterpillars, Slugs and snails, Spider mites w.r.t way of damage and control measures • Diseases: Powdery mildew, Leaf spot, Root rot, Black spot, Rust w.r.t casual organism, symptoms and control measures	5L

Basic Text & Reference Books

- Michael Wright, "The Complete Book of Gardening", Published by Ebury Press.
- S. Percy. Lancester (1977), "Gardening in India", Published by Oxford and IBH Publishing Co. Pvt. Ltd.
- Peter Mchay (1987) "Anatomy of Garden", Published by Wendward.
- Trivedi P.P (1983) "home Gardening" Published by ICAR, New Delhi.
- Barry W. Starke & John Ormsbee Simonds "Landscape Architecture: A Manual of Environmental Planning and Design"
  Publisher: McGraw-Hill Education
- Norman K. Booth & James E. Hiss "Residential Landscape Architecture: Design Process for the Private Residence"

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Generic Elective (GE)/Open Elective (OE)
Course Code –OE-201-ST-T
Course Title: Landscape Gardening

[No. of Credits: 2 C] [No. of Lectures: 30 L]

अभ्यासक्रमाचा उद्देश

- लँडस्केप नियोजनात कौशल्ये विकसित करणे.
- उपलब्ध जमिनीचा प्रभावीपणे वापर करण्यास त्यांना अनुमती देणे.
- वनस्पती आणि घरातील बागांच्या देखभालीबद्दल विद्यार्थ्यांचे ज्ञान वाढवणे.
- बागेच्या विविध सजावटीच्या वैशिष्ट्यांबद्दल अंतर्दृष्टी मिळवणे.

अभ्यासक्रमाचे निकाल:

- विद्यार्थ्यांना लँडस्केपिंग आणि नियोजनाची मूलभूत तत्त्वे समजतील
- त्यांना लँडस्केपिंगसाठी वनस्पतींची योग्य निवड आणि वापर समजेल
- त्यांना योग्य डिझाइन वापरण्यास आणि बागेतील विविध वैशिष्ट्यांचा समावेश करण्यास माहिती असेल
- त्यांना वनस्पतींची प्रभावीपणे देखभाल आणि काळजी घेण्याचे ज्ञान मिळेल
- ते उद्योजकीय कौशल्ये आत्मसात करतील

Sr. No.	Topic Details	No. of Lectures
	क्रेडिट-I	**15L**
1.	**प्रकरण-१: प्रस्तावना** • व्याख्या आणि संकल्पना • लँडस्केपिंगचे महत्त्व आणि उद्दिष्टे • लँडस्केप बागकामाची तत्त्वे • लँडस्केप नियोजनावर परिणाम करणारे घटक • लँडस्केप बागांचे प्रकार: औपचारिक आणि अनौपचारिक	5L
2.	**प्रकरण-२: बागेची रचना आणि नियोजन:** • बागेचे डिझाइन आणि आराखडे तयार करण्याची संकल्पना • डिझाइन आणि नियोजन साधने: ग्राफ पेपर, पेन्सिल आणि मार्कर, मापन टेप, कॅमेरा आणि डिझाइन सॉफ्टवेअर • साइट विश्लेषण • बागेतील प्रकाश आणि रंग • बागेची इतर वैशिष्ट्ये o लँडस्केप मार्ग o रॉक गार्डन o वॉटर गार्डन o लघु बाग o टेरेरियम o ग्रीन हाऊस	7L
3.	**प्रकरण-३: लँडस्केपसाठी वनस्पती निवड:** • विविध प्रकारच्या वनस्पतींबद्दल जाणून घेणे • विशिष्ट लँडस्केपसाठी वनस्पती निवडण्याची वैशिष्ट्ये.	3L
	क्रेडिट-II	**15L**
	प्रकरण-४: लँडस्केप बागकामातील साधने	5L

4.	• हाताची साधने: ट्रॉवेल, प्रूनिंग शीअर्स, गार्डन फोर्क्स, रेक, होज • पॉवर टूल्स: लॉन मॉवर्स, हेज ट्रिमर, चेन सॉ, स्ट्रिंग ट्रिमर, लीफ ब्लोअर्स	
5.	**प्रकरण-५: वनस्पतींची काळजी आणि सभोवतालची देखभाल** • संकल्पना आणि गरज • वनस्पती काळजी तंत्रे: छाटणी, सिंचन, फर्टिगेशन, तण व्यवस्थापन, वनस्पती संरक्षण, हंगामी देखभाल कार्ये	5L
6.	**प्रकरण-६: लँडस्केपमधील सामान्य कीटक आणि रोगांचे व्यवस्थापन:** • कीटक कीटक: मावा, पांढऱ्या माश्या, सुरवंट, स्लग आणि गोगलगाय, कोळी माइट्स नुकसान आणि नियंत्रण उपायांसाठी • रोग: पावडरी बुरशी, पानांचे ठिपके, मुळांचे कुजणे, काळे ठिपके, सामान्य जीवाणूंपासून होणारा गंज, लक्षणे आणि नियंत्रण उपाय	5L

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S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Generic Elective (GE)/Open Elective (OE)
Course Code – OE-202-ST-T
Course Title: Organic Farming

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

- Understand the principles and practices of organic farming.
- Develop skills in organic crop production, soil management, and pest control.
- Analyze the benefits and challenges of organic farming.
- Apply organic farming principles and practices in various contexts.

Course Outcomes:

Upon completing this course, students will be able to:

- Understand Organic Farming Principles
- Design Organic Farming Systems
- Manage soil health through organic amendments, composting, and conservation tillage.
- Control pests and diseases using organic methods, including biological control and cultural practices.
- Evaluate the effectiveness and sustainability of organic farming systems.
- Apply organic farming principles and practices in various agricultural contexts.

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
	Chapter-1: Organic Farming • Definition and concept of organic farming • History and evolution of organic farming • Methods: Crop diversity, Soil management, Weed management, Controlling other organisms, Livestock, Genetic modification, Tools • Benefits and challenges of organic farming	5
2.	**Chapter-2: Integrated Pest Management** • Definition and Concept • Importance • Common insect pest in Maharashtra and their way of damage • Control Methods: Physical or mechanical, Chemical and Biological	5
3.	**Chapter-3: Integrated Weed management** • Definition and Concept • Importance • Common weeds in Maharashtra • Control Methods: Physical or mechanical, Chemical and Biological	5
	Credit-II	**15L**
4.	**Chapter-4: Bio pesticides** • Definition, concept and advantages • Microbial Bio-Pesticides: Bacteria, fungi, viruses, and protozoa used as bio-pesticides. • Botanical Bio-Pesticides: Plant-derived compounds and extracts used as bio-pesticides. • Bio-Pesticide Formulation and Application • Regulatory frameworks and safety considerations for bio-pesticide use.	5

5.	**Chapter-5: Bio Fertilizers** • Definition and concept • Need of Organic Fertilizer • Benefits of Organic Fertilizer • Plant nutrients in growth and development • Sources of nutrients for Organic Agriculture: Organic Manure – FYM/Rural compost, City compost, Oil cakes, Animal wastes, Vermicompost, Poultry manure, Green Manure, Mycorrhiza, BGA, Azolla, and Liquid Manure-Jeevamrut (Slurry)	5
6.	**Chapter-6: Vermicomposting** • Definition and concept • Importance and benefits of vermicomposting • Earthworm species used in vermicomposting • Vermicomposting process (feeding, maintenance, harvesting) • Factors affecting vermicomposting (temperature, moisture, pH) • Products of vermicomposting: Compost and Vermiwash • Nutrient content and composition of vermicompost • Applications of Vermicompost in agriculture • Application of Vermiwash in agriculture • Economics of Vermicomposting	5

References:

- **"Organic Farming" by P. K. Nair:** A comprehensive guide to organic farming principles and practices in India.
- **"Organic Agriculture in India" by H. S. Gupta:** Explores the status, challenges, and opportunities of organic agriculture in India.
- **"Sustainable Agriculture and Organic Farming" by S. S. Singh:** Discusses sustainable agriculture and organic farming practices suitable for Indian conditions.
- **"Organic Farming for Sustainable Agriculture" by R. K. Srivastava:** Focuses on organic farming methods and their role in sustainable agriculture in India.
- **"Handbook of Organic Farming" by A. K. Singh:** A practical guide to organic farming, covering topics like soil management, pest control, and crop production.

S. Y. B. Sc. Seed Technology [Semester - III]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-202-ST-T

Course Title: Organic Farming

[No. of Credits: 2 C] [No. of Lectures: 30 L]

अभ्यासक्रमाची उद्दिष्टे:

- सेंद्रिय शेतीची तत्त्वे आणि पद्धती समजून घेणे
- सेंद्रिय पीक उत्पादन, माती व्यवस्थापन आणि कीटक नियंत्रणात कौशल्ये विकसित करणे
- सेंद्रिय शेतीचे फायदे आणि आव्हाने यांचे विश्लेषण करणे
- विविध संदर्भांमध्ये सेंद्रिय शेतीची तत्त्वे आणि पद्धती लागू करणे

अभ्यासक्रमाचे परिणाम:

हा अभ्यासक्रम पूर्ण केल्यानंतर, विद्यार्थी हे करू शकतील:

- सेंद्रिय शेतीची तत्त्वे समजून घेता येतील
- सेंद्रिय शेती प्रणालींची रचना करता येईल
- सेंद्रिय सुधारणा, कंपोस्टिंग आणि संवर्धन मशागतीद्वारे मातीचे आरोग्य व्यवस्थापित करतील
- जैविक नियंत्रण आणि सांस्कृतिक पद्धतींसह सेंद्रिय पद्धतींचा वापर करून कीटक आणि रोगांवर नियंत्रण ठेवता येईल
- सेंद्रिय शेती प्रणालींची प्रभावीता आणि शाश्वतता मूल्यांकन करतील
- विविध कृषी संदर्भांमध्ये सेंद्रिय शेतीची तत्त्वे आणि पद्धती लागू करतील

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Sr. No.	Topic Details	No. of Lectures
	क्रेडीट-१	**१५ तास**
	प्रकरण-१: सेंद्रिय शेती • सेंद्रिय शेतीची व्याख्या आणि संकल्पना • सेंद्रिय शेतीचा इतिहास आणि उत्क्रांती • पद्धती: पीक विविधता, माती व्यवस्थापन, तण व्यवस्थापन, इतर जीवांचे नियंत्रण, पशुधन, अनुवांशिक बदल, साधने • सेंद्रिय शेतीचे फायदे आणि आव्हाने	५
2.	**प्रकरण-२: एकात्मिक कीटक व्यवस्थापन** • व्याख्या आणि संकल्पना • एकात्मिक कीटक व्यवस्थापनाचे महत्त्व • महाराष्ट्रातील सामान्य कीटक आणि त्यांचे नुकसान करण्याचे मार्ग • नियंत्रण पद्धती: भौतिक किंवा यांत्रिक, रासायनिक आणि जैविक	५
3.	**प्रकरण-३: एकात्मिक तण व्यवस्थापन** • व्याख्या आणि संकल्पना • एकात्मिक तण व्यवस्थापनाचे महत्त्व • महाराष्ट्रातील सामान्य तण • नियंत्रण पद्धती: भौतिक किंवा यांत्रिक, रासायनिक आणि जैविक	५
	क्रेडीट-२	**१५ तास**
4.	**प्रकरण-४: जैविक कीटकनाशके** • व्याख्या, संकल्पना आणि फायदे • सूक्ष्मजीव जैविक कीटकनाशके: जैविक कीटकनाशके म्हणून वापरले जाणारे जीवाणू, बुरशी, विषाणू आणि प्रोटोझोआ. • वनस्पति जैविक कीटकनाशके: जैविक कीटकनाशके म्हणून वापरले जाणारे वनस्पती-व्युत्पन्न संयुगे आणि अर्क.	५

	• जैविक-कीटकनाशके तयार करणे आणि वापर • जैविक कीटकनाशकांच्या वापरासाठी नियामक चौकटी आणि सुरक्षितता विचार.	
5.	**प्रकरण-५: जैविक खते** • व्याख्या आणि संकल्पना • सेंद्रिय खताची गरज • सेंद्रिय खताचे फायदे • वाढ आणि विकासात वनस्पतींचे पोषक घटक • सेंद्रिय शेतीसाठी पोषक घटकांचे स्रोत: सेंद्रिय खत - शेणखत/ग्रामीण कंपोस्ट, शहरी कंपोस्ट, तेलाच्या पेंड, प्राण्यांचा कचरा, गांडूळखत, कुक्कुट खत, हिरवे खत, मायकोरिझा, बीजीए, अझोला आणि द्रव खत-जीवामृत (स्लरी)	५
	प्रकरण-६: गांडूळखत निर्मिती • व्याख्या आणि संकल्पना • गांडूळखत निर्मितीचे महत्त्व आणि फायदे • गांडूळखत निर्मितीमध्ये वापरल्या जाणाऱ्या गांडूळांच्या प्रजाती • गांडूळखत प्रक्रिया (खाद्य, देखभाल, कापणी) • गांडूळखत निर्मितीवर परिणाम करणारे घटक (तापमान, आर्द्रता, पीएच) • गांडूळखताची उत्पादने: कंपोस्ट आणि वेर्मिवाश • गांडूळखतातील पोषक घटक आणि रचना • शेतीमध्ये गांडूळखताचे उपयोग • शेतीमध्ये वेर्मिवाश उपयोग • गांडूळखत निर्मितीचे अर्थशास्त्र	५

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S. Y. B. Sc. Seed Technology [Semester - III]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code –OE-203-ST-T

Course Title: Modern Irrigation Techniques

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objective

- To understand modern irrigation techniques
- To reduce water waste
- To minimize water pollution and protect soil health
- To promote environment friendly irrigation practices that protect natural resources.
- To increase crop productivity

Course Outcomes:

- Students will understand the modern irrigation techniques
- They will understand the importance and appropriate use of water
- They know to minimize water pollution and protect soil health
- They'll get the knowledge to protect natural resources

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
	Chapter-1: Irrigation • Definition • History and Importance of Irrigation • Water sources • Water quality • Water conservation	**3L**

2.	**Chapter-2: Irrigation systems**
	• Definition and concept
	• Types of irrigation:
	  ○ Traditional: Flood, Furrow, Basin and Canal irrigation
	  ○ Modern: Precision, Sprinkler, Drip, Micro-sprinkler, Rain pipe, Rain gun and subsurface irrigation
		5L

3.	**Chapter-3: Drip Irrigation System** • Introduction and concept • Components of drip irrigation system • Designing drip irrigation system as per field requirement • Maintenance and troubleshooting of drip system. • Advantages and disadvantage of drip irrigation system • Government schemes for drip irrigation system	7L
	Credit-II	**15L**
4.	**Chapter-4: Sprinkler Irrigation System** • Introduction and concept • Sprinklers, Micro-sprinklers and rain pipes • Components of Sprinklers, Micro-sprinklers rain pipe systems • Designing as per field requirement • Maintenance and troubleshooting • Advantages and disadvantages • Government schemes for sprinkler irrigation system	9L
5.	**Chapter-5: Precision Irrigation System** • Definition and concept • Benefits of precision irrigation • Sensors and monitoring systems	4L

	• Soil moisture sensor • Weather station and climate monitoring • Automation and control systems: Time-based, Volume-based, Sensor-based	
6.	**Chapter-6: Awareness programs** • Need of awareness programs regarding modern irrigation systems • Strategies: o Workshops and training sessions o Showcasing modern irrigation techniques in expo's o Case studies o Distribution of brochures, posters and fact sheets o Feedback forms o Follow-up visits	2L

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- Mane M.S and Ayare B.L. and Magar S.S. Principles of Drip Irrigation Systems, Third Edition Jain Brothers, New Delhi
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- Goyal, M. R., *Principles and Management of Drip and Micro Irrigation*, 2012, Apple Academic Press

S. Y. B. Sc. Seed Technology [Semester - III]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code –OE-203-ST-T

Course Title: Modern Irrigation Techniques

[No. of Credits: 2 C] [No. of Lectures: 30 L]

अभ्यासक्रमाचा उद्देश

- आधुनिक सिंचन तंत्रे समजून घेणे
- पाण्याचा अपव्यय कमी करणे
- जल प्रदूषण कमी करणे आणि मातीचे आरोग्य जपणे
- नैसर्गिक संसाधनांचे संरक्षण करणाऱ्या पर्यावरणपूरक सिंचन पद्धतींना प्रोत्साहन देणे.
- पीक उत्पादकता वाढवणे

अभ्यासक्रमाचे निकाल:

- विद्यार्थ्यांना आधुनिक सिंचन तंत्रे समजतील
- त्यांना पाण्याचे महत्त्व आणि योग्य वापर समजेल
- त्यांना जल प्रदूषण कमीत कमी कसे करावे आणि मातीचे आरोग्य कसे राखावे हे माहित असेल
- त्यांना नैसर्गिक संसाधनांचे संरक्षण करण्याचे ज्ञान मिळेल

Sr. No.	Topic Details	No. of Lectures
	क्रेडिट-I	**15L**
	प्रकरण-१: सिंचन • व्याख्या • सिंचनाचा इतिहास आणि महत्त्व • पाण्याचे स्रोत • पाण्याची गुणवत्ता • जलसंधारण	**3L**
2.	**प्रकरण-२: सिंचन प्रणाली** • व्याख्या आणि संकल्पना • सिंचनाचे प्रकार: o पारंपारिक: पूर, नाला, खोरे आणि कालवा सिंचन o आधुनिक: अचूकता, स्प्रिंकलर, ठिबक, सूक्ष्म-स्प्रिंकलर, रेन पाईप, रेन गन आणि भूपृष्ठ सिंचन	5L
3.	**प्रकरण-३: ठिबक सिंचन प्रणाली** • परिचय आणि संकल्पना • ठिबक सिंचन प्रणालीचे घटक • शेताच्या गरजेनुसार ठिबक सिंचन प्रणालीची रचना • ठिबक सिंचन प्रणालीची देखभाल आणि समस्यानिवारण. • ठिबक सिंचन प्रणालीचे फायदे आणि तोटे • ठिबक सिंचन प्रणालीसाठी सरकारी योजना	7L
	क्रेडिट-II	**15L**
4.	**प्रकरण-४: स्प्रिंकलर सिंचन प्रणाली** • परिचय आणि संकल्पना • स्प्रिंकलर, मायक्रो-स्प्रिंकलर आणि रेन पाईप्स • स्प्रिंकलर, मायक्रो-स्प्रिंकलर आणि रेन पाईप सिस्टमचे घटक	8L

	• शेताच्या गरजेनुसार डिझाइन करणे • देखभाल आणि समस्यानिवारण • फायदे आणि तोटे • स्प्रिंकलर सिंचन प्रणालीसाठी सरकारी योजना	
5.	**प्रकरण-५: अचूक सिंचन प्रणाली** • व्याख्या आणि संकल्पना • अचूक सिंचनाचे फायदे • सेन्सर्स आणि देखरेख प्रणाली • मातीतील ओलावा सेन्सर • हवामान केंद्र आणि हवामान निरीक्षण • ऑटोमेशन आणि नियंत्रण प्रणाली: वेळ-आधारित, आकारमान-आधारित, सेन्सर-आधारित	4L
6.	**प्रकरण-६: जागरूकता कार्यक्रम** • आधुनिक सिंचन प्रणालींबद्दल जागरूकता कार्यक्रमांची आवश्यकता • धोरणे: o कार्यशाळा आणि प्रशिक्षण सत्रे o प्रदर्शनांमध्ये आधुनिक सिंचन तंत्रांचे प्रदर्शन o केस स्टडीज o ब्रोशर, पोस्टर्स आणि तथ्य पत्रकांचे वितरण o अभिप्राय फॉर्म o पाठपुरावा भेटी	2L

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S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Vocational Skill Courses
Course Code – VSC-221-ST-T
Course Title: Digital Herbaria

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

1. To understand the importance of Herbaria in Plant Systematics
2. To know the techniques of Herbarium Preparation
3. To familiar the digital herbaria developmental process

Course Outcomes:

1. To understand botanical knowledge with technical skills related to imaging, data management, and informatics.
2. To developed a skill to create, manage, and interpret digital herbarium collections
3. To developed a skill to keep digital records of plant specimens

Sr. No.	Topic Details	No. of Lectures
	Credit I	**15L**
1	**Digital Herbaria** 1.1 Introduction, 1.2 Definition 1.3 Scope and Application	**02L**
2	**Introduction to Herbarium Collections** 2.1 Overview of traditional herbarium practices 2.2 Role of herbaria in biodiversity research 2.3 Importance of digitalization in preserving biodiversity	**03L**
3	**Principles of Botanical Data Collection** 3.1 Plant specimen collection techniques 3.2 Proper labeling and documentation 3.3 Fieldwork and ethical considerations 3.4 Introduction to taxonomic identification	**03L**
4	**Digitization of Herbarium Specimens** 4.1 Basics of plant specimen imaging (photography and scanning) 4.2 Introduction to metadata (taxonomic, geographic, ecological data) 4.3 Handling and preserving physical specimens for digitization 4.4 Digital preservation standards and practices	**07L**
	Credit II	**15L**
5	**Image Processing and Annotation** 5.1 Editing and enhancing herbarium specimen images 5.2 software tools for digital annotation (e.g., Adobe Photoshop, open-source alternatives)	**04L**
6	**Data Management and Database Systems** 6.1 Introduction to herbarium management software (e.g., Specify, BRAHMS, TROPICOS) 6.2 Cataloging specimens and data entry standards	**03L**
7	**Geographic Information Systems (GIS) for Digital Herbaria** 7.1 Introduction to GIS in botanical studies 7.2 Georeferencing herbarium specimens (using latitude, longitude, elevation data)	**04L**

	7.3 Mapping plant distribution and ecological analysis.	
8	**Taxonomic and Ecological Research with Digital Herbaria** 8.1 Utilizing digital herbarium data for taxonomic research 8.2 Plant identification using digital keys and databases 8.3 Ecological and biogeographical analysis of digital collections 8.4 Case studies of research using digital herbarium data	**04L**

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15. UF Herbarium library, search for subject "Herbarium Techniques"
16. Links
    a. https://www.kloranebotanical.foundation/en/botanical-tools
    b. https://www.kew.org/science/digitising-kews-collections
    c. https://rprcbbsr.in/View/digital_herbarium.aspx

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Vocational Skill Courses
Course Code –VSC-222-ST-T
Course Title: Modern Irrigation Techniques

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objective

- To understand modern irrigation techniques
- To reduce water waste
- To minimize water pollution and protect soil health
- To promote environment friendly irrigation practices that protect natural resources.
- To increase crop productivity

Course Outcomes:

- Students will understand the modern irrigation techniques
- They will understand the importance and appropriate use of water
- They know to minimize water pollution and protect soil health
- They'll get the knowledge to protect natural resources

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
	Chapter-1: Irrigation • Definition • History and Importance of Irrigation • Water sources • Water quality • Water conservation	**3L**

2.	**Chapter-2: Irrigation systems**
	• Definition and concept
	• Types of irrigation:
	  ○ Traditional: Flood, Furrow, Basin and Canal irrigation
	  ○ Modern: Precision, Sprinkler, Drip, Micro-sprinkler, Rain pipe, Rain gun and subsurface irrigation
		5L

3.	**Chapter-3: Drip Irrigation System** • Introduction and concept • Components of drip irrigation system • Designing drip irrigation system as per field requirement • Maintenance and troubleshooting of drip system. • Advantages and disadvantage of drip irrigation system • Government schemes for drip irrigation system	7L
	Credit-II	**15L**
4.	**Chapter-4: Sprinkler Irrigation System** • Introduction and concept • Sprinklers, Micro-sprinklers and rain pipes • Components of Sprinklers, Micro-sprinklers rain pipe systems • Designing as per field requirement • Maintenance and troubleshooting • Advantages and disadvantages • Government schemes for sprinkler irrigation system	9L
5.	**Chapter-5: Precision Irrigation System** • Definition and concept • Benefits of precision irrigation • Sensors and monitoring systems	4L

	• Soil moisture sensor • Weather station and climate monitoring • Automation and control systems: Time-based, Volume-based, Sensor-based	
6.	**Chapter-6: Awareness programs** • Need of awareness programs regarding modern irrigation systems • Strategies: o Workshops and training sessions o Showcasing modern irrigation techniques in expo's o Case studies o Distribution of brochures, posters and fact sheets o Feedback forms o Follow-up visits	2L

REFERENCES

- A.M.Michael and S.D.Khepar "Water well and pump engineering" (9th Edition, 2005) Tata McGraw-Hill publishing Company Ltd. New Delhi
- Mane M.S. and Ayare B.L. "Principles of Sprinkler Irrigation systems", Second Edition, Jain Brothers, New Delhi
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S. Y. B. Sc. Seed Technology [Semester - III]

Course Category – Vocational Skill Course (VSC)

Course Code: VSC-223-ST-T

Course Title: Weed and Its Management

[No. of Credits: 2 C] **[No. of Lectures: 30L]**

Course Objectives:

1. To impart knowledge on weed identification, classification, and their impact on crops.
2. To train students in weed survey methods and weed population analysis techniques.
3. To provide practical knowledge of herbicide types, formulations, and application methods.
4. To evaluate the economic and ecological aspects of different weed control practices.

Course Outcomes:

1. Identify common weeds and conduct field surveys to assess weed infestation.
2. Analyze weed competition periods and calculate weed control efficiency parameters.
3. Select appropriate herbicides and accurately calculate application rates for different formulations.

Chapter No.	Topic	No. of Lectures
Credit- I		**15 L**
1.	**Introduction to weed** • Definition and concept • Harmful Weeds • Beneficial effects of weeds	2L
2.	**Weed Identification** • Weed Classification Systems: Morphological, physiological, and ecological classification. • Weed Categories: Annuals, perennials, biennials, and their characteristics. • Weed Habitats: Weeds in different environments, such as crops, pastures, and aquatic ecosystems. • Weed Identification: Key characteristics for identifying weeds.Problematic and invasive weed species (e.g., *Parthenium, Lantana, Cyperus, Eichhornia*)	4L
3.	**Weed Biology** • Dormancy • Viability and germination; • Growth habit; • Reproduction and multiplication; • Dispersal • Persistence and tolerance/ resistance.	3L
4.	**Weed competition** • Crop-weed interference and general principles; • Different factors of competition (nutrients, water, light, space)	3L

	• Allelopathy	
5.	**Concept of weed control** • Prevention • Eradication • Control and management	3L
Credit-II		**15 L**
6.	**Physical or Mechanical Method of Weed Control-** • Definition and concept • Types of Physical/Mechanical Methods: Hand weeding, hoeing, tillage, mowing, and mulching. • Tools and eqiupments	4L
7.	**Chemical Method of Weed Control** • Definition • Types of herbicides • Mode of action • Environmental impact	4L
8.	**Biological Methods of Weed Control** • Definition and concept • Bio-herbicides, Biological Control- Insect (*Zygogramma bicolorata*), pathogens and pnematodes	4L
10.	**Integrated weed management:** • Definition and Concept • Practices	3L

References:

- Scientific Weed Management-Gupta, O.P. (1999).
- Principle of Weed Science.-Rao, V.S. (1998).
- Principles of Agronomy-Reddy, S. R. (2007).
- Weed Management Handbook-R. J. Stephens
- Principles of Weed Science" - V. S. Rao
- Weed Science: Principles and Practices- G. C. Klingman, F. M. Ashton, and L. J. Noordhoff
- Integrated Weed Management- S. R. Reddy
- Principles of Agronomy-S. R. Reddy
- Crop Production: Principles and Practices- H. D. Foth

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Indian Knowledge System (IKS)
Course Code – IKS-ST-T
Course Title: Medicinal Plants in Traditional Systems of Medicine

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives

- Understand the foundational principles of Indian medical traditions.
- Explore the historical, philosophical, and scientific dimensions of Ayurveda and related systems.
- Examine the integration of body, mind, spirit, and environment in health.
- Evaluate the relevance of IKS-based health sciences in contemporary contexts.

Course Outcomes:

- Students will achieve a clear understanding of the foundational principles and core concepts of Indian medical traditions, especially Ayurveda.
- They will be able to analyze the historical development, philosophical underpinnings, and scientific basis of Ayurveda and related Indian Knowledge Systems (IKS).
- They will be able to interpret the holistic framework of Indian health sciences, emphasizing the interconnectedness of body, mind, spirit, and environment.
- They will be able to critically evaluate the applicability and relevance of IKS-based health practices in addressing contemporary health and wellness challenges.

Sr. No.	Topics	Weightage
	Credit-I	
1.	**Chapter-1: Introduction** • Definition and concept • Objectives of IKS • Need and Importance of IKS • Fields of IKS	2L
2.	**Chapter-2: Traditional Medicine System in India (under AYUSH)** • Definition and Concept • Medicine Systems in India: Ayurveda, Siddha, Unani, Yoga and Naturopathy and Homeopathy • Other Medicine systems: Ethnomedicine	3L
3.	**Chapter-3: Foundations of Indian Medical Thought** • Concept of health (Swasthya) and disease (Vyadhi) • Tridosha theory: Vata, Pitta, Kapha • Panchamahabhuta (Five elements) and Prakriti (body constitution) • Sources of knowledge: Vedas, Charaka Samhita, Sushruta Samhita, Ashtanga Hridayam	3L

4.	**Chapter-4: Ayurveda – Principles and Practice**
	• Eight branches of Ayurveda (Ashtanga Ayurveda)
	  ○ Kaya Chikitsa (General medicine)
	  ○ Shalya Tantra (Surgery)
	  ○ Shalakya Tantra (ENT & Eye diseases)
	  ○ Kaumarbhritya (Pediatrics)
	  ○ Agada Tantra (Toxicology)
	  ○ Rasayana (Rejuvenation)
	  ○ Vajikarana (Aphrodisiacs)
	  ○ Bhuta Vidya (Psychiatry)
	• Ayurvedic diagnostic techniques: Nadi Pariksha (pulse), tongue, eye, urine analysis.
		7L

	• Treatment modalities:
	  ○ Ahara (diet)
	  ○ Vihara (lifestyle)
	  ○ Aushadha (medicine)
	  ○ Panchakarma (detoxification therapies)
	• Sanitation, seasonal regimens (Ritucharya), and daily routines (Dinacharya).	

	Credit-II	
5.	**Chapter-5: Yoga and Health** • Definition and history of Yoga • Ashtanga Yoga (Eight limbs) • Health benefits of Yoga • Therapeutic Yoga for stress, anxiety, lifestyle diseases. • Integration of Yoga with Ayurveda.	4L

6.	**Chapter-6: Siddha and Unani Systems**
	• Siddha medicine:
	  ○ Definition and concept
	  ○ Origin and Philosophy
	  ○ Diagnosis in Siddha medicine
	  ○ Treatment methods
	  ○ Medicines used
	• Unani medicine:
	  ○ Definition and Concept
	  ○ Origin and Philosophy
	  ○ Diagnosis in Unani medicine
	  ○ Treatment methods
	  ○ Medicines Used
		6L

7.	**Chapter-7: Ethnomedicine: Indigenous Health Systems and Healing Practices** • Definition and concept • Ethnic societies in Maharashtra • Ethnomedicinal plants and health care • Integrating Traditional and Modern Medicine: Challenges and Opportunities	3L
8.	**Chapter-8: IKS and Contemporary Healthcare** • Scientific validation of Ayurvedic practices. • Integration with modern medicine (AYUSH). • Ethical issues: Intellectual property, biopiracy, standardization. • National and global initiatives (Ministry of AYUSH, Central Council of Indian Medicine (CCIM), WHO)	2L

References:

- Introduction to Indian Knowledge System: Concepts and Applications, Archak, K.B. (2012). Kaveri Books, New Delhi.ISBN-13:978-9391818203
- Introduction To Indian Knowledge System: Concepts and Applications, Mahadevan, B.Bhat, Vinayak Rajat, Nagendra Pavana R.N.PHI, ISBN: 9789391818203
- **The Heart of Yoga**–T.K.V. Desikachar
- **Light on Yoga**–B.K.S. Iyengar
- Ayurveda: The Science of Self-Healing-Dr. Vasant Lad
- The Complete Book of Ayurvedic Home Remedies- Dr. Vasant Lad
- Ayurveda: A Life of Balance-Maya Tiwari
- National Institute of Siddha eBook
- Siddha Medicine: A Beginner's Guide to the Ancient Indian Healing System by Dani Twain

- Siddha Medicine: A Handbook of Traditional Remedies-Dr. Thottam
- Introduction to Siddha Medicine-T. Thirunarayanan
- **Introduction to Unani Medicine-CCRUM (Central Council for Research in Unani Medicine, India)**
- **Basics of Unani Medicine- Hakim Syed Zillur Rahman**
- **Indian Systems of Medicine**– K. Nishteswar
- Dictionary of Indian Folk Medicine and Ethnobotany-S. K. Jain
- Notable Plants in Ethnomedicine of India-S. K. Jain

S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Field Project (FP)
Course Code – FP-231-ST

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:
The objective of this field project is to provide hands-on experience to undergraduate students in seed technology, enabling them to apply theoretical knowledge in real-world settings.

Course Outcomes: Upon completing this course, students will be able to:
- Understand to describe the structure, development, and physiology of seeds.
- Conduct seed quality tests, including germination, purity, and vigor tests.
- Evaluate the effects of storage conditions on seed viability and vigor.
- Develop and evaluate seed treatments and coatings to enhance seed performance.
- Identify and solve problems related to seed quality, storage, and germination.

GUIDELINES

Project Topics
1. Seed Quality Testing: Evaluate the quality of seeds using various testing methods.
2. Seed Germination and Vigor: Investigate factors affecting seed germination and vigor, Test different factors that can break seed dormancy and enhance germination
3. Seed Storage and Deterioration: Study the effects of storage conditions on seed viability and vigor, Analyze different plant materials to increase shelf life of seeds
4. Seed Treatment and Coating: Evaluate the effectiveness of seed treatments and coatings

Project Requirements
1. Conduct a thorough literature review on the chosen topic.
2. Collect and prepare seed samples for testing.
3. Conduct seed quality tests, such as germination, purity, and vigor tests.
4. Analyze data using statistical methods and software.
5. Present findings in a clear and concise manner.

Fieldwork Guidelines
1. Collect seeds from various sources, following proper sampling methods.
2. Prepare seeds for testing, including cleaning, drying, and storing.
3. Conduct seed quality tests, following standard protocols.
4. Follow all safety measures during field work

Report Writing
1. Follow a standard format for report writing.
2. Include introduction, literature review, methodology, results, discussion, and conclusion.
3. References: Cite sources properly.

Evaluation Criteria
Student field project should be evaluated for total 50 marks (15 marks for internal and 35

marks for external evaluation). During internal assessment following points should be considered

1. Appropriateness of the field project
2. Punctuality of the student
3. Field work
4. Field diary
5. Viva voce

The criteria for external evaluation should be

1. Originality and significance of the project, its relevance to the field, and potential impact.
2. Soundness of methodology, research design, and approach.
3. Quality, accuracy, and thoroughness of data collection, analysis, and interpretation.
4. Validity and significance of findings, conclusions, and recommendations.
5. Clarity, organization, and effectiveness of the project report and presentation.

Timeline

1. Submit a project proposal outlining the topic, objectives, and methodology.
2. Conduct fieldwork and collect data.
3. Analyze data and interpret results.
4. Submit the final report at the time of practical examination

Resources

1. Faculty Guidance: Students will receive guidance from faculty members.
2. Seed Testing Equipment: Necessary equipment for seed testing will be provided.
3. Literature Resources: Access to relevant literature and online resources.

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CREDIT FRAMEWORK FOR SYBSc SEED TECHNOLOGY, SEMESTER–IV (Level 5.0 / 200)

COURSE DETAILS	COURSE CODE	COURSE TITLE	CREDITS
Vertical – 1 (V1)			
Major Core Courses – (3T + 1P) x 2C = 8C	ST-251-MJ	Seed Physiology	**2 C**
	ST-252-MJ	Seed Testing	**2 C**
	ST-253-MJP	Practical Based on ST-251-MJ & ST-252-MJ	**2 C**
Major Elective Courses - (0C)	-----	------	**0 C**
Vertical – 2 (V2)			
Minor Courses – (1T + 1P = 4C) (Any one from basket)	ST-291-MN	Seed Physiology	**2 C**
	ST-292-MN	Seed Testing	
	ST-294-MNP	Practical based on ST-291-MN	**2 C**
	ST-295-MNP	Practical based on ST-292-MN	
Vertical – 3 (V3)			
Generic Elective (GE) / Open Elective (OE) - (1P = 2C) (Any one from basket)	OE-251-ST-P	Flower Design Techniques	**2 C**
	OE-252-ST-P	Nursery Techniques	
	OE-253-ST-P	Sericulture Farming	
Vertical – 4 (V4)			
Vocational Skill Courses (VSC) – (1T /P = 2C) (Any one from basket)	**VSC-271-ST-P**	Mushroom Technology	**2 C**
	VSC-272-ST-P	Fermentation Technology	
	VSC-273-ST-P	Agricultural Safety	
Skill Enhancement Courses (SEC) – (1T / 1P = 2C) (Any one from basket)	SEC-251-ST-P	Artificial Intelligence and Agriculture	**2 C**
	SEC-252-ST-P	Sericulture Farming	
	SEC-253-ST-P	Herbal Cosmetics and Nutraceutics	
Vertical – 5 (V5)			
IKS - (0C)	-----	------	**0 C**
Ability Enhancement Courses (AEC) – (1T = 2C)	AEC-251-MAR / HIN	Marathi / Hindi	**2 C**
VEC – (0C)	-------	-------	**0 C**
Vertical – 6 (V6)			
CEP – (2C)	CEP-232-ST	Community Engagement Programme (CEP)	**2 C**
Co-curricular Courses (CC) – (1T = 2C)	CC-251	Any one from the basket provided by SPPU	**2 C**
		Total Credits (V1+V2+V3+V4+V5+V6)	**22 C**
		Total Credits for SYBSC - Semester III (22 C) + Semester IV (22 C)	**44 C**

Exit Option: Award of UG Diploma (UG Diploma in Botany) in Major and Minor with 88 Credits and an additional 4 Credits core NSQF course / Internship OR Continue with Major and Minor.

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category - Major Core Course

Course Code – ST-251-MJ

Course Title: Seed Physiology

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:

1: To understand the concept of Seed Physiology.
2: To understand the Water relation of seeds and factors affecting germination
3: To understand the role of Respiration and storage
4: To gain the knowledge regarding seed deterioration, ageing and maturity
5: To learn the concept of seed dormancy, viability and vigor

Course Outcomes:

1: Students will be acquainted with the concept of seed physiology
2: They will understand the basic concept of Water relation of seeds and factors affecting germination
3: Students will understand role of Respiration and storage
4: They'll gain the knowledge regarding basic principles of seed deterioration, ageing and maturity
5: They'll the concept of seed dormancy, viability and vigor

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction** • Definition and concept • Chemical composition of seed: carbohydrates, starch, protein, lipids, minerals and vitamins • Importance	**2L**
2.	**Chapter-2: Water relations of Seed** • Water uptake by seeds and seedlings • Seed- soil water relationship • Permeability of seed covering • Temperature effects • After effect of soaking seeds	**3L**
3.	**Chapter-3: Factors affecting germination** • Temperature • Maturity • Seed Size • Moon effects • Chemicals • Heavy water • Pressure	**3L**
4.	**Chapter-4: Respiration** • Definition and concept • Factors affecting respiration of seeds • Respiratory quotient • Respiratory enzymes	**3L**
5.	**Chapter-5: Seed Deterioration and ageing**	**4L**

	• Definition and concept • Stages of seed deterioration • Causes of Seed deterioration • Seed ageing and its effect • Factors influencing seed ageing	
	Credit-II	
6.	**Chapter-6: Seed maturity** • Definition and Concept • Physiological changes of fruit during maturity and senescence • Pre-harvest factors affecting the seed quality and the physiology • Biochemical changes during seed maturation • Fruit ripening: A stress acclimation phenomenon	**4L**
7.	**Chapter-7: Storage and Life span of seeds** • Life span Vs storage • Short lived seeds (Recalcitrant) • Long lived seeds (Orthodox) • Factors affecting life span of seeds • Cold storage	**4L**
8.	**Chapter-8: Seed Dormancy** • Definition and concept • Types of dormancy • Factors affecting dormancy • Methods of breaking seed dormancy	**4L**
9.	**Chapter-9: Seed Vigor and Seed Viability** • Definition- Seed Vigor, Seed Viability and concept • Factors affecting seed vigor	**3L**

References:

- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers (India)
- Plant Physiology-S. N. Pandey and B. K. Sinha, Vikas Publishing House Pvt. Ltd.
- Seed Technology- Harpal Singh Tomar, Rama Publishing House
- Seed Technology- Agrawal, 2005. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Text Book on Realization of Seed Physiology-Sanjay Kumar Bordolui, Narendra Publication- New Delhi

S. Y. B. Sc. Seed Technology [Semester - IV]
Course Category - Major Core Course
Course Code – ST-252-MJ
Course Title: Seed Testing

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:
1: To understand the concept of Seed Testing Laboratory
2: To understand the Seed sampling and its registration
3: To understand the role of various test employed in seed testing
4: To gain the knowledge regarding data analysis and reporting

Course Outcomes:
1: Students will be acquainted with the concept of seed testing laboratory
2: They will understand the basic concept of Seed sampling and its registration
3: Students will understand role of various test employed in seed testing
4: They'll gain the knowledge regarding data analysis and reporting

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**

1.	**Chapter-1: Introduction**
	• Definition and concept
	• Importance of seed testing in agriculture
	• Overview of Seed Testing Process
	  ○ Purity analysis
	  ○ Moisture Testing
	  ○ Germination testing
	  ○ Vigor testing
	  ○ Health testing
	  ○ Genetic Purity Test
		2L

2.	**Chapter-2: Seed Testing Organizations and its role** • International Seed Testing Association (ISTA) • Association of Official Seed Analysts (AOSA) • Central Seed Testing Laboratory (CSTL) • State Seed Testing Laboratory (SSTL)-Maharashtra • Seed Testing Standards 1. ISTA rules 2. National seed testing standards	**3L**
3.	**Chapter-3: Seed Testing Laboratory** • Objectives of Seed Testing • Layout for Seed Testing Laboratory and Furnishing • Staff- Seed Testing Officer/Analyst, Laboratory Manager, Seed Technicians, Quality Assurance Officer, Sample Receptionist, Data Entry Operator, Laboratory Assistant • Seed Testing Equipment.	**4L**
4.	**Chapter-4: Seed Sampling** • Definition and concept	**3L**

	• General principles of seed sampling • Tools used for seed sampling • Kinds of Sampling • Procedure of Seed Sampling	
5.	**Chapter-5: Receipt and Registration of Seed Samples** • Types of seed samples (Service, Certification and Official sample) • Receiving and precautions during registration of samples • Procedure of registration • Heterogeneity test	**3L**
	Credit-II	
6.	**Chapter-6: Physical Purity Analysis** • Definition of physical purity • Composition of seed lot for physical purity analysis: pure seed, Other Crop seed, Weed seed and inert matter • Physical Purity Work Board • Procedure for physical purity analysis by weight and number • Minimum seed certification standards for physical purity percentage by weight for F & C seed	**3L**

7.	**Chapter-7: Moisture Testing**
	• Definition and concept
	• Objectives
	• Methods of moisture testing
	  • Direct: Oven drying
	  • Indirect: Universal moisture meter and Digital moisture meter
		3L

8.	**Chapter-8: Germination Testing** • Definition and concept • Objectives • General requirements for seed germination testing • Procedure for seed germination testing • Methods for seed germination testing: Paper towel-top of paper (TP) and Between paper; Sand- On and In; Soil- On and In • Seedling evaluation-Normal, Abnormal, Decayed, Un-germinated seeds: hard, Dead and Fresh but un-germinated seed.	**3L**
9.	**Chapter-9: Seed Vigor Testing** • Objectives • Methods for determination of seed vigor • Physical Method- Seed Size, Seed Density, Physical Soundness • Biochemical Method- Seed Viability (TZ test), Electrical conductivity Test	**3L**
10.	**Chapter-10: Genetic Purity Test** • Definition • Objectives • Grow Out Test for determination of genetic purity • Advantages and Disadvantages	**2L**
11.	**Chapter-11: Data Analysis and Reporting** • Test result interpretation • Reporting and documentation	**1L**

References:

- HandbookofAgriculture-IndianCouncilofAgriculturalResearch,NewDelhi
- ExperimentalSeedScienceandTechnology-Umaraniet.al.2006.,Agrobios,Jodhpur
- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers (India)
- Plant Physiology-S. N. Pandey and B. K. Sinha, Vikas Publishing House Pvt. Ltd.
- Seed Technology- Harpal Singh Tomar, Rama Publishing House
- Seed Technology- Agrawal, 2005. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Text Book on Realization of Seed Physiology-Sanjay Kumar Bordolui, Narendra Publication- New Delhi

S. Y. B. Sc. Seed Technology [Semester - IV]
Course Category - Major Core Course (MJ)
Course Code – ST-253-MJP
Course Title: Practical Based on ST-251-MJ and ST-252-MJ

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To examine diseased symptoms and seed vigor
2. To calculate moisture percentage and germination percentage
3. To understand grow out test and effect of light on seed germination
4. To know the process of imbibition, respiration in seeds and methods to break seed dormancy

Course Outcomes:

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

1. Examine diseased symptoms and seed vigor
2. Calculate moisture percentage and germination percentage
3. Understand grow out test and effect of light on seed germination
4. Understand the methods to break seed dormancy

Sr. No.	Practical	Weightage
1.	Visual examination of dry seeds for diseased symptoms	1P
2.	Observe effect of light on seed germination with suitable examples	1P
3.	Calculate the percent of imbibition in seeds (Soft and hard seed)	1P
4.	Demonstrate seed respiration and measure the rate of respiration.	1P
5.	To study physical and chemical method for breaking seed dormancy	1P
6.	Estimation of proteins from suitable seed sample by using Lowry's method	1P
7.	To analyze seed vigor using physical method-Seed Size, Seed Density and Seed Soundness	1P
8.	Demonstration of seed sampling and dividing equipment's	1P
9.	To study technique of physical purity analysis by weight method with suitable example	1P
10.	To analyze moisture percent with direct method using suitable seed sample	1P
11.	To analyze moisture percent with indirect method using suitable seed sample	1P
12.	To study different methods for testing percent seed germination-Soil, Sand and Paper	1P
13.	To calculate percent seed germination using suitable seed sample	1P
14.	To evaluate germinated seedlings w.r.t normal, abnormal, hard, dead, fresh but un-germinated seed	1P
15.	To test seed vigor by physical method- Seed Size, Seed Density, Physical Soundness	1P
16.	To test seed vigor by biochemical method- Tetrazolium test (TZ)	1P
17.	To understand the technique of Grow Out Test for genetic purity analysis	2P
18.	Visit to any seed testing laboratory/research institute	2P

Note: Any 15 practical's to be conducted

S. Y. B. Sc. Seed Technology [Semester - IV]
Course Category - Minor Core Course
Course Code – ST-291-MN
Course Title: Seed Physiology

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:
1: To understand the concept of Seed Physiology.
2: To understand the Water relation of seeds and factors affecting germination
3: To understand the role of Respiration and storage
4: To gain the knowledge regarding seed deterioration, ageing and maturity
5: To learn the concept of seed dormancy, viability and vigor

Course Outcomes:
1: Students will be acquainted with the concept of seed physiology
2: They will understand the basic concept of Water relation of seeds and factors affecting germination
3: Students will understand role of Respiration and storage
4: They'll gain the knowledge regarding basic principles of seed deterioration, ageing and maturity
5: They'll understand the concept of seed dormancy, viability and vigor

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**
1.	**Chapter-1: Introduction** • Definition and concept • Chemical composition of seed: carbohydrates, starch, protein, lipids, minerals and vitamins • Importance	**2L**
2.	**Chapter-2: Water relations of Seed** • Water uptake by seeds and seedlings • Seed- soil water relationship • Permeability of seed covering • Temperature effects • After effect of soaking seeds	**3L**
3.	**Chapter-3: Factors affecting germination** • Temperature • Maturity • Seed Size • Moon effects • Chemicals • Heavy water • Pressure	**3L**
4.	**Chapter-4: Respiration** • Definition and concept • Factors affecting respiration of seeds • Respiratory quotient • Respiratory enzymes	**3L**

5.	**Chapter-5: Seed Deterioration and ageing** • Definition and concept • Stages of seed deterioration • Causes of Seed deterioration • Seed ageing and its effect • Factors influencing seed ageing	**4L**
	Credit-II	
6.	**Chapter-6: Seed maturity** • Definition and Concept • Physiological changes of fruit during maturity and senescence • Pre-harvest factors affecting the seed quality and the physiology • Biochemical changes during seed maturation • Fruit ripening: A stress acclimation phenomenon	**4L**
7.	**Chapter-7: Storage and Life span of seeds** • Life span Vs storage • Short lived seeds (Recalcitrant) • Long lived seeds (Orthodox) • Factors affecting life span of seeds • Cold storage	**4L**
8.	**Chapter-8: Seed Dormancy** • Definition and concept • Types of dormancy • Factors affecting dormancy • Methods of breaking seed dormancy	**4L**
9.	**Chapter-9: Seed Vigor and Seed Viability** • Definition- Seed Vigor, Seed Viability and concept • Factors affecting seed vigor	**3L**

References:

- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers (India)
- Plant Physiology-S. N. Pandey and B. K. Sinha, Vikas Publishing House Pvt. Ltd.
- Seed Technology- Harpal Singh Tomar, Rama Publishing House
- Seed Technology- Agrawal, 2005. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Text Book on Realization of Seed Physiology-Sanjay Kumar Bordolui, Narendra Publication- New Delhi

S. Y. B. Sc. Seed Technology [Semester - IV]
Course Category - Minor Core Course
Course Code – ST-292-MN
Course Title: Seed Testing

[No. of Credits: 2 C] **[No. of Lectures: 30 L]**

Course Objectives:
1: To understand the concept of Seed Testing Laboratory
2: To understand the Seed sampling and its registration
3: To understand the role of various test employed in seed testing
4: To gain the knowledge regarding data analysis and reporting

Course Outcomes:
1: Students will be acquainted with the concept of seed testing laboratory
2: They will understand the basic concept of Seed sampling and its registration
3: Students will understand role of various test employed in seed testing
4: They'll gain the knowledge regarding data analysis and reporting

Sr. No.	Topic Details	No. of Lectures
	Credit-I	**15L**

1.	**Chapter-1: Introduction**
	• Definition and concept
	• Importance of seed testing in agriculture
	• Overview of Seed Testing Process
	  ○ Purity analysis
	  ○ Moisture Testing
	  ○ Germination testing
	  ○ Vigor testing
	  ○ Health testing
	  ○ Genetic Purity Test
		2L

2.	**Chapter-2: Seed Testing Organizations and its role** • International Seed Testing Association (ISTA) • Association of Official Seed Analysts (AOSA) • Central Seed Testing Laboratory (CSTL) • State Seed Testing Laboratory (SSTL)-Maharashtra • Seed Testing Standards 1. ISTA rules 2. National seed testing standards	**3L**
3.	**Chapter-3: Seed Testing Laboratory** • Objectives of Seed Testing • Layout for Seed Testing Laboratory and Furnishing • Staff- Seed Testing Officer/Analyst, Laboratory Manager, Seed Technicians, Quality Assurance Officer, Sample Receptionist, Data Entry Operator, Laboratory Assistant • Seed Testing Equipment.	**4L**
4.	**Chapter-4: Seed Sampling** • Definition and concept	**3L**

	• General principles of seed sampling • Tools used for seed sampling • Kinds of Sampling • Procedure of Seed Sampling	
5.	**Chapter-5: Receipt and Registration of Seed Samples** • Types of seed samples (Service, Certification and Official sample) • Receiving and precautions during registration of samples • Procedure of registration • Heterogeneity test	**3L**
	Credit-II	
6.	**Chapter-6: Physical Purity Analysis** • Definition of physical purity • Composition of seed lot for physical purity analysis: pure seed, Other Crop seed, Weed seed and inert matter • Physical Purity Work Board • Procedure for physical purity analysis by weight and number • Minimum seed certification standards for physical purity percentage by weight for F & C seed	**3L**

7.	**Chapter-7: Moisture Testing**
	• Definition and concept
	• Objectives
	• Methods of moisture testing
	  • Direct: Oven drying
	  • Indirect: Universal moisture meter and Digital moisture meter
		3L

8.	**Chapter-8: Germination Testing** • Definition and concept • Objectives • General requirements for seed germination testing • Procedure for seed germination testing • Methods for seed germination testing: Paper towel-top of paper (TP) and Between paper; Sand- On and In; Soil- On and In • Seedling evaluation-Normal, Abnormal, Decayed, Un-germinated seeds: hard, Dead and Fresh but un-germinated seed.	**3L**
9.	**Chapter-9: Seed Vigor Testing** • Objectives • Methods for determination of seed vigor • Physical Method- Seed Size, Seed Density, Physical Soundness • Biochemical Method- Seed Viability (TZ test), Electrical conductivity Test	**3L**
10.	**Chapter-10: Genetic Purity Test** • Definition • Objectives • Grow Out Test for determination of genetic purity • Advantages and Disadvantages	**2L**
11.	**Chapter-11: Data Analysis and Reporting** • Test result interpretation • Reporting and documentation	**1L**

References:

- HandbookofAgriculture-IndianCouncilofAgriculturalResearch,NewDelhi
- ExperimentalSeedScienceandTechnology-Umaraniet.al.2006.,Agrobios,Jodhpur
- Seed Technology- Dhirendra Khare and M. S. Bhale, Scientific Publishers (India)
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- Seed Technology- Harpal Singh Tomar, Rama Publishing House
- Seed Technology- Agrawal, 2005. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
- Seed Technology-B. S. Dahiya and K. N. Rai, Kalyani Publishers, New Delhi
- Seed Science and Technology- Brijesh Tiwari, Oxford Book Company, Jaipur
- Text Book on Realization of Seed Physiology-Sanjay Kumar Bordolui, Narendra Publication- New Delhi

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category - Minor Core Course

Course Code – ST-294-MNP

Course Title: Practical Based on ST-291-MN

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To understand the qualitative tests for carbohydrates, proteins, lipids and effect of light on seed germination
2. To examine diseased symptoms and effects of seed deterioration on germination and seedling growth
3. To understand importance of proper seed storage
4. To learn the concept of seed dormancy, viability and vigor

Course Outcomes:

1. Students will understand the qualitative tests for carbohydrates, proteins, lipids and effect of light on seed germination
2. They will be able to examine diseased symptoms and effects of seed deterioration on germination and seedling growth
3. They will understand importance of proper seed storage
4. They'll understand the concept of seed dormancy, viability and vigor

Sr. No.	Practical	Weightage
1.	Qualitative test for carbohydrates, proteins, and lipids	1P
2.	Observe effect of light on seed germination with suitable examples	1P
3.	Calculate the percent of imbibition in seeds (Soft and hard seed)	1P
4.	Demonstrate seed respiration and measure the rate of respiration.	1P
5.	Visual examination of dry seeds for diseased symptoms	1P
6.	Demonstrate the effects of seed deterioration on germination and seedling growth	1P
7.	To study the characteristics of mature and immature seeds.	1P
8.	To demonstrate the importance of proper seed storage conditions on seed viability and germination.	1P
9.	To study stored grain pest-Fungal pathogen	1P
10.	To study stored grain pest-insect pest	1P
11.	To study physical and chemical method for breaking seed dormancy	2P
12.	To analyze seed vigor using physical method-Seed Size, Seed Density and Seed Soundness	1P
13.	Estimation of proteins from suitable seed sample by using Lowry's method	2P

S. Y. B. Sc. Seed Technology [Semester - IV]
Course Category - Minor Core Course
Course Code - ST 295 MNP
Course Title: Practical Based on ST 292 MN

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To know the seed testing, sampling and dividing equipment's
2. To understand the techniques of physical purity, moisture content and seed germination analysis
3. To understand the seed vigor and grow out test

Course Outcomes:

1. Students will be acquainted with seed testing, sampling and dividing equipment's
2. They will understand the techniques of physical purity, moisture content and seed germination analysis
3. They will understand the seed vigor and grow out test

Sr. No.	Practical	Weightage
1.	Demonstration of seed testing equipment's	1P
2.	Demonstration of seed sampling and dividing equipment's	1P
3.	To study technique of physical purity analysis by weight method with suitable example	1P
4.	To analyze moisture percent with direct method using suitable seed sample	1P
5.	To analyze moisture percent with indirect method using suitable seed sample	1P
6.	To study different methods for testing percent seed germination- Soil, Sand and Paper	2P
7.	To calculate percent seed germination using suitable seed sample	1P
8.	To evaluate germinated seedlings w.r.t normal, abnormal, hard, dead, fresh but un-germinated seed	1P
9.	To test seed vigor by physical method- Seed Size, Seed Density, Physical Soundness	1P
10.	To test seed vigor by biochemical method- Tetrazolium test (TZ)	1P
11.	To understand the technique of Grow Out Test for genetic purity analysis	2P
12.	Visit to any seed testing laboratory/research institute	2P

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S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-251-ST-P

Course Title: Flower Design Techniques

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. Learn the basic principles and techniques of floral design, including line, form, balance, and colour harmony.
2. Develop advanced skills in creating various floral arrangements, such as bouquets, centrepieces, wreaths, and corsages, using different types of flowers and foliage.
3. Understand the proper care and handling of flowers, including selection, conditioning, and storage, to ensure longevity and freshness in arrangements.

Course Outcomes:

1. Develop proficiency in creating various basic floral arrangements, including hand-tied bouquets, vase arrangements, and table centrepieces, using proper techniques and principles of design.
2. Acquire advanced skills in creating complex floral designs, such as cascading bouquets, floral arches, and large-scale installations, demonstrating creativity and attention to detail.
3. Gain knowledge of different floral design styles, such as traditional, contemporary, and seasonal, and stay updated with current trends in the floral industry.

Sr. No	Topic Details	Weightage
1.	To study the structure of typical flower.	1P
2.	To study the seasonal flowers and their characteristics	1P
3.	To study the types/styles of flower arrangements (e.g., Ikebana, European, Contemporary) with the help of ICT tools.	1P
4.	To demonstrate the essential tools and materials used in flower arrangement	1P
5.	To study the selection of flowers and foliage types used for flower arrangement	2P
6.	Demonstration of drying and preservation of flowers.	1P
7.	Preparation of traditional flower designs - garland, Gajra, Veni etc.	1P
8.	Preparation of floral Rangoli	1P
9.	To study the different type of bouquets	2P
10.	To study the methods of vase life improvement of cut flowers.	1P
11.	Visit to floriculture industry and study of floral business economics	2P
12.	To study the role of flower arrangement in event management	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-251-ST-P

Course Title: Flower Design Techniques

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

उद्दिष्टे:

1. रेषा, आकार, संतुलन आणि रंगसंगती यासह फुलांच्या रचनेची मूलभूत तत्त्वे आणि तंत्रे जाणून घेणे.
2. विविध प्रकारची फुले आणि पानांचा वापर करून पुष्पगुच्छ, मध्यवर्ती भाग, पुष्पहार आणि कोर्सेज यासारख्या विविध फुलांच्या रचना तयार करण्यात प्रगत कौशल्ये विकसित करणे.
3. फुलांची योग्य काळजी आणि हाताळणी समजून घेणे, ज्यामध्ये निवड, कंडिशनिंग आणि साठवणूक यांचा समावेश आहे, जेणेकरून व्यवस्थेत दीर्घायुष्य आणि ताजेपणा सुनिश्चित होईल.

परिणाम:

1. योग्य तंत्रे आणि डिझाइनच्या तत्त्वांचा वापर करून हाताने बांधलेले पुष्पगुच्छ, फुलदाण्यांची व्यवस्था आणि टेबल सेंटरपीससह विविध मूलभूत फुलांच्या रचना तयार करण्यात प्रवीणता विकसित करता येईल
2. कॅस्केडिंग पुष्पगुच्छ, फुलांच्या कमानी आणि मोठ्या प्रमाणात स्थापना यासारख्या जटिल फुलांच्या रचना तयार करण्यात प्रगत कौशल्ये आत्मसात करता येईल, ज्यामुळे सर्जनशीलता आणि तपशीलांकडे लक्ष देता येईल.
3. पारंपारिक, समकालीन आणि हंगामी अशा विविध फुलांच्या डिझाइन शैलींचे ज्ञान मिळेल आणि फुलांच्या उद्योगातील सध्याच्या ट्रेंडसह अपडेट राहता येईल.

Sr. No.	Topic Details	Weightage
1.	सामान्य फुलांच्या रचनेचा अभ्यास करणे.	1 P
2.	हंगामी फुले आणि त्यांची वैशिष्ट्ये अभ्यासणे	1P
3.	आयसीटी साधनांच्या मदतीने फुलांच्या रचनांचे प्रकार/शैली (उदा., इकेबाना, युरोपियन, समकालीन) अभ्यासणे.	1P
4.	फुलांच्या व्यवस्थेत वापरल्या जाणाऱ्या आवश्यक साधनांचे आणि साहित्याचे प्रात्यक्षिक दाखवणे.	1P
5.	फुलांच्या व्यवस्थेसाठी वापरल्या जाणाऱ्या फुलांच्या आणि पानांच्या प्रकारांच्या निवडीचा अभ्यास करणे.	2P
6.	फुले वाळवण्याचे आणि जतन करण्याचे प्रात्यक्षिक	1P
7.	पारंपारिक फुलांच्या नक्षीकामांची तयारी - हार, गजरा, वेणी इ.	1P
8.	फुलांच्या रांगोळीची रचना करणे	1P
9.	वेगवेगळ्या प्रकारच्या पुष्पगुच्छांचा अभ्यास करणे	2P
10.	कापलेल्या फुलांचे आयुष्य वाढवण्याच्या पद्धतींचा अभ्यास करणे.	1P
11.	फुलशेती उद्योगाला भेट आणि फुलांच्या व्यवसायाच्या अर्थशास्त्राचा अभ्यास	2P
12.	कार्यक्रम व्यवस्थापनात फुलांच्या व्यवस्थेची भूमिका अभ्यासणे	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-252-ST-P

Course Title: Nursery Techniques

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

- To equip students with the knowledge and practical skills necessary to establish, manage, and operate a successful plant nursery
- To understand propagation techniques, nursery layout and design.
- To understand plant health management, business planning, and marketing strategies.

Course Outcomes:

- The students will acquire knowledge and practical skills necessary to establish, manage, and operate a successful plant nursery
- They'll understand propagation techniques, nursery layout and design.
- They'll understand plant health management, business planning, and marketing strategies.

Sr. No.	Name of Practical	No. of Practical
1.	To study of tools and implements used in plant nursery management	1P
2.	To study different types of media for propagation of plants in nursery beds	1P
3.	To study seed treatments for breaking seed dormancy and inducing vigorous seedling growth	1P
4.	Preparation and application of plant growth regulator solutions for seed germination and vegetative propagation	1P
5.	Preparation of different nursery beds and sowing of seeds	1P
6.	To perform and practice different techniques of cutting and budding in raising plant saplings	1P
7.	To perform and practice different techniques of layering and grafting in raising plant saplings	1P
8.	To study micro propagation technique for any suitable ornamental crop and its subsequent hardening	1P
9.	To study common diseases and its management in nurseries	2P
10.	To study common insect pests and its management in nurseries	1P
11.	To study technique for Potting and Repotting for Ornamental plants.	1P
12.	To study uprooting/digging, labelling and packing of nursery plants	1P
13.	Economic analysis of nursery operations	1P
14.	Visit to Ornamental/Vegetable/ Medicinal/Fruit/ Flower Crop Nursery/ Tissue culture laboratory	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-252-ST-P

Course Title: Nursery Techniques

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

अभ्यासक्रमाची उद्दिष्टे:

- यशस्वी रोपवाटिका स्थापन करण्यासाठी, व्यवस्थापित करण्यासाठी आणि चालवण्यासाठी आवश्यक असलेले ज्ञान आणि व्यावहारिक कौशल्ये विद्यार्थ्यांना सुसज्ज करणे
- प्रसार तंत्रे, रोपवाटिका मांडणी आणि डिझाइन समजून घेणे.
- वनस्पती आरोग्य व्यवस्थापन, व्यवसाय नियोजन आणि विपणन धोरणे समजून घेणे.

अभ्यासक्रमाचे निकाल:

- विद्यार्थ्यांना यशस्वी रोपवाटिका स्थापन करण्यासाठी, व्यवस्थापित करण्यासाठी आणि चालवण्यासाठी आवश्यक असलेले ज्ञान आणि व्यावहारिक कौशल्ये प्राप्त होतील.
- त्यांना प्रसार तंत्रे, रोपवाटिका मांडणी आणि डिझाइन समजेल.
- त्यांना वनस्पती आरोग्य व्यवस्थापन, व्यवसाय नियोजन आणि विपणन धोरणे समजतील.

Sr. No.	Name of Practical	No. of Practical
1.	वनस्पती रोपवाटिका व्यवस्थापनात वापरल्या जाणाऱ्या अवजारांचा अभ्यास करणे	1P
2.	नर्सरी बेडमध्ये वनस्पतींच्या प्रसारासाठी वापरल्या जाणाऱ्या विविध प्रकारच्या माध्यमांचा अभ्यास करणे	1P
3.	बियाण्याची निष्क्रियता तोडण्यासाठी आणि जोमदार रोपांची वाढ करण्यासाठी बियाणे प्रक्रियांचा अभ्यास करणे	1P
4.	बियाणे उगवण क्षमता वाढवण्यासाठी वापरल्या जाणाऱ्या पोषक द्रव्यांचा अभ्यास करणे	1P
5.	वेगवेगळ्या रोपवाटिका तयार करणे आणि बियाणे पेरणे	1P
6.	रोपांच्या वाढीसाठी कटिंग व बडिंग तंत्रांचा वापर करणे	1P
7.	रोपांच्या वाढीसाठी लेयरिंग व कलम करण्याच्या तंत्रांचा वापर करणे	1P
8.	कोणत्याही योग्य शोभेच्या पिकासाठी आणि त्यानंतरच्या कडकपणासाठी सूक्ष्म प्रसार तंत्राचा अभ्यास करणे	1P
9.	नर्सरीमध्ये सामान्य रोग आणि त्यांचे व्यवस्थापन अभ्यास करणे	2P
10.	नर्सरीमध्ये सामान्य कीटक आणि त्यांचे व्यवस्थापन अभ्यास करणे	1P
11.	शोभेच्या वनस्पतींसाठी कुंडी आणि पुनरुत्पादन तंत्राचा अभ्यास करणे.	1P
12.	नर्सरी वनस्पतींचे उपटणे/खोदणे, लेबलिंग आणि पॅकिंगचा अभ्यास करणे	1P
13.	नर्सरी ऑपरेशन्सचे आर्थिक विश्लेषण	1P
14.	शोभेच्या/भाजीपाला/औषधी/फळ/फुलांच्या पिकांच्या रोपवाटिका/ऊती संवर्धन प्रयोगशाळेला भेट देणे	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-253-ST-P

Course Title: Sericulture Farming

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

- To equip students with the knowledge and practical skills necessary to establish, manage, and operate a successful sericulture unit
- To understand life cycle and rearing of silkworms
- To understand business planning, and acquire entrepreneurship skills in sericulture industry.

Course Outcomes:

- The students will acquire knowledge and practical skills necessary to establish, manage, and operate a successful sericulture unit
- They'll understand life cycle and scientific rearing skills of silkworms
- They'll understand business planning, and acquire entrepreneurship skills in sericulture industry.

Practical No.	Name Of Practical	Weightage
1.	To study the life cycle of silkworm (*Bombyx mori*)	2P
2.	To compare different species of silkworms	1P
3.	To study of mouth parts and salivary glands of silkworm	1P
4.	To study the technique of mounting of silkworm spinneret	1P
5.	To understand importance and cultivation of mulberry plant in sericulture	3P
6.	To understand the rearing technique and management of silkworms in sericulture	2P
7.	To study different equipment's used in sericulture	1P
8.	To demonstrate Cocoon harvesting and silk reeling	1P
9.	To study diseases of silkworm in sericulture	1P
10.	To study enemies of silkworm in sericulture	1P
11.	Visit to sericulture farm and silk processing unit	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Generic Elective (GE)/Open Elective (OE)

Course Code – OE-253-ST-P

Course Title: Sericulture Farming

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

अभ्यासक्रमाची उद्दिष्टे:

- यशस्वी रेशीम शेती युनिट स्थापन करण्यासाठी, व्यवस्थापित करण्यासाठी आणि चालवण्यासाठी आवश्यक असलेले ज्ञान आणि व्यावहारिक कौशल्ये विद्यार्थ्यांना सुसज्ज करणे
- रेशीम किड्यांचे जीवनचक्र आणि संगोपन समजून घेणे
- व्यवसाय नियोजन समजून घेणे आणि रेशीम उद्योगात उद्योजकता कौशल्ये आत्मसात करणे.

अभ्यासक्रमाचे परिणाम:

- विद्यार्थ्यांना यशस्वी रेशीम शेती युनिट स्थापन करण्यासाठी, व्यवस्थापित करण्यासाठी आणि चालवण्यासाठी आवश्यक असलेले ज्ञान आणि व्यावहारिक कौशल्ये प्राप्त होतील.
- त्यांना रेशीम किड्यांचे जीवनचक्र आणि वैज्ञानिक संगोपन कौशल्ये समजतील.
- त्यांना व्यवसाय नियोजन समजेल आणि रेशीम उद्योगात उद्योजकता कौशल्ये आत्मसात होतील.

Practical No.	Name Of Practical	Weightage
1.	रेशीम किड्याचे जीवनचक्र अभ्यासणे (बॉम्बिक्स मोरी)	2P
2.	रेशीम किड्यांच्या विविध प्रजातींची तुलना करणे	1P
3.	रेशीम किड्याच्या तोंडाचे भाग आणि लाळ ग्रंथींचा अभ्यास	1P
4.	रेशीम किड्याच्या स्पिनरेटच्या माउंट करण्याच्या तंत्राचा अभ्यास करणे	1P
5.	रेशीम शेतीमध्ये तुती वनस्पतीचे महत्त्व आणि लागवड समजून घेणे	3P
6.	रेशीम किड्यांचे संगोपन तंत्र आणि व्यवस्थापन समजून घेणे	2P
7.	रेशीम शेतीमध्ये वापरल्या जाणाऱ्या विविध उपकरणांचा अभ्यास करणे	1P
8.	कोकून (कोष) वेचणी आणि रेशीम रीलिंग प्रात्यक्षिक	1P
9.	रेशीम शेतीमध्ये रेशीम किड्यांचे रोग अभ्यासणे	1P
10.	रेशीम किड्यांचे शत्रूंचा अभ्यास करणे	1P
11.	रेशीम शेती आणि रेशीम प्रक्रिया युनिटला भेट देऊन अहवाल सादर करणे	1P

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S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Vocational Skill Courses (VSC)

Course Code – VSC-271-ST-P

Course Title: Mushroom Technology

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

Upon completing this course, students will be able to:

1. Demonstrate practical skills in mushroom cultivation, including spawn preparation, substrate preparation, and mushroom growth management.
2. Identify different species of mushrooms, including edible and poisonous varieties.
3. Manage mushroom farms, including maintaining optimal growing conditions, controlling pests and diseases, and ensuring quality control.
4. Prepare various mushroom-based products, such as dried mushrooms, mushroom powder, and mushroom-based food products.
5. Apply mushroom technology in various fields, including agriculture, food processing, and environmental conservation.

Course Outcomes

1. Gain hands-on experience in mushroom cultivation and management.
2. Acquire technical knowledge of mushroom technology and its applications.
3. Develop problem-solving skills in mushroom cultivation and management.

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Sr. No.	Practical	Weightage
1	To study the morphology of mushroom	1P
2	To demonstrate the comparison of different types of mushrooms	1P
3	To demonstrate equipment's required for mushroom production	1P
4	To understand the technique of spawn preparation in Oyster	2P
5	To study cultivation of Oyster mushroom	2P
6	To study cultivation of White button mushroom	2P
7	To study harvest and post-harvest techniques in mushrooms	1P
8	To study mushroom preservation techniques	1P
9	To prepare mushroom recipes-mushroom pulao and mushroom soup	1P
10	To prepare mushroom recipes -mushroom omelets and mushroom curry	1P
11	To prepare mushroom recipes-mushroom pakora, and mushroom pickles	1P
12	Visit to Mushroom Industry / Small scale unit and report writing	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Vocational Skill Courses (VSC)

Course Code – VSC-272-ST-P

Course Title: Fermentation Technology

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

- To learn the extraction and processing techniques of soybean products such as soymilk and tofu.
- To understand traditional fermentation methods for preparing probiotic and nutritious beverages.
- To acquire hands-on skills in preparing indigenous Indian fermented foods and beverages.
- To study the preparation of Ayurvedic formulations like Asava and Arishta from medicinal plants.
- To gain practical exposure through industrial visits to fermentation-related industries and document observations.

Course Outcomes:

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

- Extract and prepare soymilk and tofu using standard methods.
- Demonstrate proficiency in fermenting vegetables and grains to produce traditional probiotic drinks.
- Prepare a variety of traditional Indian fermented foods and beverages with proper techniques.
- Understand the formulation and preparation of Ayurvedic Asava and Arishta products.
- Analyze and report the industrial fermentation processes based on firsthand observation during visits.

Sr. No.	Title of the Practical	No. of Practical
1	Extraction of Soymilk from soybean with the help of suitable method.	1 P
2	Preparation of Tofu – Soyapaneer from Soyabean Seeds.	2 P
3	Fermentation of vegetables to obtain probiotic drink – Kanji.	1 P
4	Preparation of traditional, nutritious drink - Ambil from suitable plant material - Barnyard Millet (Bhagar).	2 P
5	Preparation of traditional Indian beverage solkadi from kokam fruits.	1 P
6	Preparation of wine from any suitable fruit (Pomegranate / Sapota / Pineapple or any seasonal fruit available in market).	1 P
7	Preparation of *Asava* (*Aloe vera* / Punarnava).	2 P
8	Preparation of *Arishta* from the suitable plant material (Arjun /Ashoka bark or powder)	1 P
9	Preparation of Malt from the Suitable material (Ragi).	1 P
10	Demonstration of various Indian fermented products: (Idli, Dosa, Meduwada, Wheat Kurdai, Rice Papad)	1 P
11	Industrial Visit to any one Fermentation Industry/Sugarcane Industry / Ayurvedic Ras Shala located in the nearby area and report writing	2 P

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S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Vocational Skill Course (VSC)

Course Code – VSC-273-ST-P

Course Title: Agricultural Safety

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. Identify various hazards present in agricultural environments and understand their impact on human health and safety.
2. Demonstrate safe handling and use of agricultural tools, machinery, chemicals, and storage practices.
3. Develop basic first aid skills, including CPR and emergency response, relevant to common farm injuries.

Course Outcomes:

1. Recognize farm-related hazards and assess risks associated with agricultural practices.
2. Demonstrate correct use of PPE, pesticide application techniques, and safe chemical handling on farms.
3. Design and deliver social awareness campaigns on key agricultural safety issues such as pesticide safety and child safety.

Sr. No.	Name of Practical	Weightage
1.	To study the identification of farm hazards and common injury points	2P
2.	Demonstration of personal protective equipment (PPE) use during pesticide spraying	1P
3.	To study safe mixing and application of agricultural chemicals	1P
4.	Field exercise on safe intercultural practices (hoeing, weeding, etc.)	1P
5.	To study child safety measures on farms	1P
6.	Preparation and use of a first aid kit for agricultural emergencies	1P
7.	Demonstration of basic CPR and first response training for farm injuries	1P
8.	To study farm pond risk assessment and safety feature planning	1P
9.	To study safe handling, charging, and storage of agricultural batteries	2P
10.	To demonstrate tractor safety drill: pre-operational check, safe starting, and driving practice	2P
11.	To study a safe storage of fertilizers and agrochemicals	1P
12.	Design of a social awareness poster campaign on pesticide safety	1P

S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category –Skill Enhancement Courses (SEC)

Course Code – SEC-251-ST-P

Course Title: Artificial Intelligence and Agriculture

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. Introduce foundational AI tools such as Python, Jupyter Notebooks, and key libraries (Tensor Flow, Scikit-learn, Biopython) relevant to botanical data analysis.
2. Demonstrate AI applications in plant identification through image-based classification using open-source datasets.
3. Enable predictive modeling skills to forecast plant growth, yield, and disease using machine learning techniques.
4. Apply NLP techniques for parsing botanical texts and developing taxonomy-based chatbots.
5. Utilize AI for ecological and conservation studies through spatial data analysis and biodiversity monitoring.

Course Outcomes:

1. Students will set up and operate AI environments like Google Colab/Jupyter and use Python for botanical applications.
2. Students will classify plant species/images using CNN models trained on datasets such as LeafSnap or Pl@ntNet.
3. Students will apply NLP methods to extract and interpret botanical information from textual sources.
4. Students will build predictive models to analyze plant growth, stress responses, and yield using environmental data.
5. Students will use AI tools in conservation biology to map species distributions and detect ecological changes.

Sr. No.	Title of the Practical	No. of Practical
1	**Introduction to AI and Its Role in Agriculture** Hands-on with Google Colab / Jupyter Notebooks. Explore open-source botanical datasets (e.g., plant images, herbarium data).	1 P
2	**AI in Plant Identification Using Image Recognition** Use TensorFlow/Keras to classify leaf images. Build a model using the LeafSnap or Pl@ntNet dataset.	1 P
3	**Predictive Modeling in Plant Growth and Disease** Train regression models for plant height/yield prediction based on environmental data. Use CNN to detect diseases (e.g., rust, blight) from plant leaf images.	1 P
4	**Introduction to AI in Ecology** Overview of ecological data types (species count, environmental, spatial) Set up Python environment (Jupyter, pandas, matplotlib)	2 P
5	**Natural Language Processing (NLP) in Botany** Use NLP tools (e.g., spaCy, NLTK) to analyze botanical descriptions. Build a chatbot that answers basic plant taxonomy questions.	1 P
6	**Introduction to AI and Bioinformatics** Explore bioinformatics databases (NCBI, UniProt, PDB). Python exercises using Biopython for sequence retrieval and parsing. Intro to machine	2 P

	learning libraries: Scikit-learn, Pandas, NumPy.	
7	**Introduction to AI in Agriculture** Introduction to Python, Jupyter Notebook, and basic data handling (Pandas, Numpy). Explore open agricultural datasets (e.g., FAO, ICAR, Kaggle Agri datasets). Create a simple program to analyze crop yield data.	2 P
8	**AI for Precision Agriculture** Train regression models to predict irrigation schedules using weather and soil data. Use decision tree classifiers for soil type or crop suitability analysis.	2 P
9	**AI in Plant Physiology and Stress Analysis** Use RGB/thermal image data of plants under stress. Train a deep learning model to detect stress types. Analyze physiological traits: wilting, color change, chlorosis	2 P
10	**AI in Conservation and Biodiversity Monitoring** Predict plant distribution using SDMs (Species Distribution Models). Use satellite/drone data to monitor plant communities. Detect habitat degradation or invasive species using AI	1 P

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Research Papers

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S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Skill Enhancement Course (SEC)

Course Code – SEC-252-ST-P

Course Title: Sericulture Farming

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To equip students with the knowledge and practical skills necessary to establish, manage, and operate a successful sericulture unit
2. To understand life cycle and rearing of silkworms
3. To understand business planning, and acquire entrepreneurship skills in sericulture industry.

Course Outcomes:

1. The students will acquire knowledge and practical skills necessary to establish, manage, and operate a successful sericulture unit
2. They'll understand life cycle and scientific rearing skills of silkworms
3. They'll understand business planning, and acquire entrepreneurship skills in sericulture industry.

Practical No.	Name Of Practical	Weightage
1.	To study the life cycle of silkworm (*Bombyx mori*)	2P
2.	To compare different species of silkworms	1P
3.	To study of mouth parts and salivary glands of silkworm	1P
4.	To study the technique of mounting of silkworm spinneret	1P
5.	To understand importance and cultivation of mulberry plant in sericulture	3P
6.	To understand the rearing technique and management of silkworms in sericulture	2P
7.	To study different equipment's used in sericulture	1P
8.	To demonstrate Cocoon harvesting and silk reeling	1P
9.	To study diseases of silkworm in sericulture	1P
10.	To study enemies of silkworm in sericulture	1P
11.	Visit to sericulture farm and silk processing unit	1P

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S. Y. B. Sc. Seed Technology [Semester - IV]

Course Category – Skill Enhancement Course (SEC)

Course Code – SEC-253-ST-P

Course Title: Herbal Cosmetics and Nutraceutics

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objectives:

1. To introduce students to the preparation and formulation of herbal cosmetics and nutraceutics.
2. To develop practical skills in using plant-based ingredients for product development.
3. To understand safety, labelling, and quality aspects of herbal products.

Course Outcomes:

After completing this course, students will be able to:

1. Prepare basic herbal cosmetics and nutraceutical formulations.
2. Identify plant-based active ingredients and their benefits.
3. Demonstrate knowledge of packaging, preservation, and safety measures in product development.

Sr. No.	Title of Practical	No. of Practicals
1	Demonstration of Herbal Cosmetics and Nutraceutical products w.r.t ingredients and applications	1P
2	To perform the experiment for preparation of herbal face pack using suitable herbs and honey	1P
3	To perform the experiment for preparation of herbal hand wash or body wash and shampoo using suitable herbs	1P
4	To perform the experiment for preparation of herbal lip balm using suitable herbs and essential oils	1P
5	To perform the experiment for preparation of herbal hair oil using coconut oil and suitable herbs	1P
6	To perform the experiment for preparation of herbal soaps with suitable materials	1P
7	To perform the experiment for preparation of herbal tooth powder with suitable herbs	1P
8	To perform the experiment for preparation of herbal perfumes (Attars) from suitable aromatic plants	1P

9	To perform the experiment for preparation of herbal ubtans (powders) from suitable herbs	1P
10	To perform the experiment for preparation herbal tea using suitable herbs	1P
11	To perform the experiment for preparation amla and aloe vera juice	1P
12	Formulation of immunity booster balls using herbs, seeds, and dry fruits	1P
13	To perform the experiment for preparation triphala churna using hirda, beheda and amla fruits	1P
14	Product safety testing (pH, organoleptic characters- Color, taste, texture, smell, etc.), Packaging and labelling of herbal cosmetic/nutraceutical products	1P
15	Development and submission of a unique herbal product	1P

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S. Y. B. Sc. Seed Technology [Semester - III]
Course Category – Community Engagement Programme (CEP)
Course Code – CEP-232-ST

[No. of Credits: 2 C] **[No. of Lectures: 60 L]**

Course Objective

The objective of this community engagement program is to provide undergraduate students with hands-on experience in seed technology while contributing to the local community.

Course Outcome:

Upon completing this program, students will be able to:

- Demonstrate practical skills in seed technology, including seed selection, storage, and germination.
- Effectively communicate seed technology knowledge to local farmers and community members.
- Engage with the local community, understand their needs, and provide solutions related to seed technology.
- Develop training materials and resources for community members on seed technology.
- Evaluate the impact of the community engagement program on the local community.
- Students will have opportunities to network with local farmers, community members, and other stakeholders.

Program Structure

- Students will provide information regarding high-quality seeds in the market to local farmers or community members.
- Students will provide training on seed technology, including seed selection, storage, and germination.
- Students will create awareness regarding importance of soil health testing, water quality analysis, use of quality seeds, fertigation, organic farming and role of honey bee in agriculture
- Students will conduct farm visits to demonstrate seed technology applications like testing germination percentage before sowing the seeds, seed treatment and provide technical support.
- Students will engage with the local community through workshops, demonstrations, or other outreach activities.

Program Requirements

- Students will develop training materials and resources for community members.
- Students will plan and conduct farm visits, including demonstrations and technical support.
- Students will engage with the local community through various outreach activities.

Evaluation Criteria

Student Community Engagement Program (CEP) shall be evaluated for total 50 marks (15 marks for internal and 35 marks for external evaluation). During internal assessment following points shall be considered

- Effectiveness of program design and planning.
- Student participation and engagement in program activities.
- Effectiveness of student communication with community members.

- Demonstration of seed technology knowledge and skills.
- Maintenance of program records and documentation.

The criteria for external evaluation shall be

- Clarity, organization, and effectiveness of the report and presentation.
- Assessment of the program's impact on the local community.
- Evaluation of student learning outcomes and skills development.
- Assessment of the program's effectiveness in achieving its objectives.

Resources

- Seed Technology Expertise: Access to seed technology experts and resources.
- Community Partnerships: Partnerships with local farmers, community members, and other stakeholders.
- Logistical Support: Support for program planning, execution, and evaluation.

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