

Karmaveer Bhaurao Patil University, Satara
Yashavantrao Chavan Institute of Science,
Satara
(Autonomous)

Syllabus
For
B. Sc. II (Seed Technology)
As Per NEP-2020

Academic Year 2024 - 2025

Karmaveer Bhaurao Patil University, Satara
Yashwantrao Chavan Institute of Science, Satara
Syllabus to be introduced from June 2024

Bachelor of Science (B. Sc.) Part - II: Seed Technology

1. TITLE: Seed Technology

2. YEAR OF IMPLEMENTATION: 2024 - 2025

3. PREAMBLE:

The B. Sc. Seed Technology Course-under autonomy will be effective from the academic year 2024 - 2025. It has been prepared to keep in view the unique requirements of B. Sc. Seed Technology students as per NEP-2020. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences. The emphasis is to provide students with the latest information along with due weightage to the concepts of classical botany so that they can understand and appreciate the current interdisciplinary approaches in the study of plant sciences and their role in societal development. The Course-content also lists new practical exercises so the students get a hands-on experience with the latest techniques that are currently in use. The Course-will also inspire students to pursue higher studies in Seed Technology, for becoming an entrepreneur, and enable students to get employed in plant-based industries.

4. GENERAL OBJECTIVES OF THE COURSE:

- i. To introduce the concept of the new concepts in seed technology.
- ii. To enrich students training and knowledge that would be useful in seed industries so that the farmers will get quality seeds.
- iii. To develop skill in practical work, experiments and laboratory materials in seed technology.
- iv. To help students build up a progressive and successful career in seed industry.
- v. To inculcate the sense of job responsibilities and to promote the possibilities of self-employment.

5. DURATION: 01 year

6. PATTERN: CBCS Semester

7. MEDIUM OF INSTRUCTION: English

8. STRUCTURE OF COURSE:

Course Structure as per NEP-2020

Level	Sem	Subject - 1 Major		Subject - 2 Minor							Total
		T	P	T	P	VSC	SEC	AEC	VEC	CC	
		5	III	4 (2 Theory Paper)	4 (2 Practical Papers)	2	2	2	2	4	
	IV	4 (2 Theory Paper)	4 (2 Practical Papers)	2	2	2	2	4	---	2	22

1)THIRD SEMESTER

Semester - III

Sr. No.	Subject Title	Theory					Practical	
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Seed Technology (Major)	Course – I BBST -231	Hybrid Seed Production: Principles and Practice	4	2	Practical Course - I - BBST 233 and 234	4	2
		Course - II BBST-232	Seed Pathology and Seed Entomology					
3.	Seed Technology (Minor)	Course – II BBST-235	Principles of Seed Pathology			Practical Course -- BBST 236		
4.	VSEC (Vocational Skill Enhancement Courses)	Course – BBSTP-VSEC-1	Seed Bank	3	2	--	--	--
5	Skill Enhancement Course (SEC)	BBSTP-2SEC	Seed Processing Technology		2	--	--	--

FOURTH SEMESTER

Semester – IV

Sr. No.	Subject Title	Theory					Practical	
		Course No. & Course Code	Title of Course	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Seed Technology (Major)	Course – I BBST 241	Recent Trends in Seed Production	5	4	Practical Course – II BBSP-243 and 244	4	2
		Course – II BBST -242	Seed Biotechnology					
2.	Seed Technology (Minor)	Course – BBST -245	Techniques to improve Seed Production	5	4	Practical Course – IIBBSP-246	4	2
4.	VSEC (Vocational Skill Enhancement Courses)	Course – I BBST- PSEC3	Seed Aesthetics BBST	3	2	--	--	--
5	Skill Enhancement Course (SEC)	BBST- VEC	Seed Health Technology		2	--	--	--
6	Co curricular Courses	CC						2

2) Structure and titles of B. Sc. Course

Vocational Skill Course (VSE):

Course-I: Seed Bank

Skill Enhancement Course (SEC):

Course-I: Seed Preservation

3) OTHER FEATURES:

A) LIBRARY:

Reference Books, Textbooks, journals, and Periodicals are available in Institute and Departmental Library.
(Separate reference lists are attached along with the respective Course-syllabus)

B) EQUIPMENT:

a) Computer, LCD projector, visualizer, smart board

b) Laboratory Equipment:

1. Microscope with a digital camera
2. Digital weighing balance
3. pH meter
4. Microtome
5. Autoclave
6. Hot Air Oven
7. Incubator
8. Refrigerator

SEMESTER - III

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

Seed Technology-Major

Semester- III

Paper: V (BBST-231):Hybrid Seed Production: Principles and Practice

Learning objectives: Students will be able to:

1. Understand the various aspects of hybrid seed production.
2. gain the basic knowledge about hybrid seed production in cereal and pulse crops.
3. Understand the basic knowledge about hybrid seed production in oil and cash crops.
4. Understand the basic knowledge of hybrid seed production in vegetable crops.

Credits=2	SEMESTER-III BBST -231: Hybrid Seed Production: Principles and Practice	No. of hours perunit/ credits
Unit-I	Principles and methods of hybrid seed production	
	1.1 Introduction of Hybrid Seed Production: Definition, Objectives, Applications. 1.2 Selection of variety and its types, Selection of land for hybrid seed production. 1.3 Agronomic management for hybrid seed production (sowing, row spacing, fertilizers, irrigation, harvesting and threshing), Previous crop effects. 1.4 Effect of environment on seed quality.	(07)
	Hybrid seed production in cereals and pulse crops	
UNIT-II	Floral biology, pollinators, agronomic practices, field inspection and maintenance of varietal purity of following crops: 1) Cereal crops: Rice, Jowar, Wheat 2) Pulse crops: <i>Pigeon pea, Chick pea, Vigna etc</i>	(08)
	Hybrid seed production in oil seeds and cash crops	

UNIT-III	Floral biology, pollinators, agronomic practices, field inspection and maintenance of varietal purity of following crops: 1) Oil seed crops: Groundnut, Sunflower, Soybean 2) Cash crops: Sugarcane, pomegranate, banana	(07)
	Hybrid seed production in vegetable crops	
UNIT-IV	4.1 Floral biology, wild pollinators, agronomic practices, field inspection and maintenance of varietal purity of following crops: Onion, tomato, spinach. 4.2 Advances in hybrid seed production 4.3 Floral biology, pollinators, agronomic practices, field inspection and maintenance of varietal purity of following crops: 1) Cereal crops: Rice, Jowar, Wheat 2) Pulse crops: Pigeon pea, Chick pea, <i>Vigna</i> etc	(08)

Course Outcomes :Students will be able to:

1. explain and describe the concepts in hybrid seed production.
2. describe the hybrid seed production in different crop plants.
3. discuss the principles and methods of hybrid seed production.
4. implement different agronomic practices.

References:

1. D., Khare M.S. Bhale (2014). Seed Technology. 2nd ed. Jodhpur: Scientific Publisher. Ransingh
2. S., Kolhapure A. (2013). Principals of Seed Technology. Pune: Universal Publication.
3. B.D Singh. (2006). Plant Breeding. 2nd ed. Ludhiana: Kalyani Publication
4. A.K., Joshi Singh B.D. (2005). Seed Science and Technology. New Delhi: Kalyani Publishers
5. Prasad R. (2004). Textbook of Field Crop Production. New Delhi: Directorate of information and Publication of agriculture.
6. M.S., FagariaChoudhary B.R., Dhaka R.S. (2003). Vegetable Crops Production Technology. New Dehli: Kalyani Publisher.
7. R.L., Agarwal (2003). Seed Technology. 2nded. New Delhi: Oxford and IBH Publishing Company Pvt.
8. V.L. Chopra (2001). Plant Breeding Field crops. New Delhi: Oxford and IBH Publishing Company Pvt. Ltd.
9. B. P Pandey. (2001). A Text book of Botany Angiosperms. New Delhi: S. Chand and Company Ltd

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B. Sc. Part -II: Seed Technology-Major

Semester-III

Paper VI

Course : BBST -232 Seed Pathology and Seed Entomology

Learning Objectives : Students will be able to:

1. understand the basic knowledge about seed pathology.
2. know the effect of pathogens on seed-borne disease development.
3. understand the principles of seed-borne disease management.
4. know the concept of seed entomology.

Credits - 2	Semester-III Course – BBST-232 (Seed Pathology and Seed Entomology)	No.of hrs/unit/ credits
Unit-I	Unit-I: Introduction to Seed Pathology	(08)
	1.1 Introduction, history, and importance of seed pathology. 1.2 Seed-borne diseases (fungi, bacteria). 1.3 Losses caused by seed-borne pathogens.	
UNIT-II	Unit-II: Seed Infection and Management	(07)
	2.1 Concept and significance of infection. 2.2 Mechanism of transmission of seed pathogens. 2.3 Preventive measures for seed borne pathogens practiced in India.	
UNIT-III	Unit-III: Introduction to Seed Entomology	(08)
	3.1 History and Importance of Seed Entomology. 3.2 General model of the life cycle of insects (Gradual, Complete, and Incomplete Metamorphosis). 3.3 Losses Caused by insect pest.	

Unit – IV: Seed Insect Pests and Their Management		
UNIT-IV	<p>4.1 Study of the following insect pests with respect to the scientific name, marks of identification, nature of the damage, and their management: Jowar stem borer; Brinjal fruit Borer; Gram pod borer;</p> <p>4.2 Stored Grain Pest: Lesser Grain borer; Rice Weevil; Rust red flour beetle; Khapra beetle; Pulse beetle; Saw-toothed beetle.</p>	(07)

Course Outcomes : Students will be able to:

1. explain and describe the concepts of seed pathology.
2. differentiate the morphological and anatomical changes in seeds by pathogens.
3. identify and know about the stored grain pests.
4. implement the control measures of seed-borne pathogens.

References

1. Agrawal, (2018) Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
2. AK Joshi, and BD Singh, (2017). Seed Science and Technology; Edition. Revised; Publisher. Kalyani Publishers.
3. J. D. Hutchins, and J. E., Reeves (Eds.). (1997). Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.
4. V. K. Agarwal, and J. B. Sinclair, (1993). Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi
5. Agarwal RN., (1982), Seed Technology; Author, R. L. Agrawal; Publisher, Oxford, and IBH Publishing.
6. Paul Neergaard., (1988). Seed Pathology. MacMillan, London.
7. Suryanarayana D., (1978). Seed Pathology. Vikash Publ., New Delhi.

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B. Sc. Part – II

Semester- III

BSP - 233

PRACTICAL COURSE–Based on BSP-231

Course Objectives: Student will be able to:

- 1) know the practical knowledge about the floral biology of crop plants.
- 2) understand the practical knowledge about preparation of crop field area layout.
- 3) employ various techniques in different experimental aspects of seed pathology.
- 4) understand the seed entomology.

Credits-2	SEMESTER-III BSP:233	No. of hrs /unit/ credits
	<p style="text-align: center;">Practical's Group A based on BSP 231</p> <ol style="list-style-type: none"> 1. Studies of inflorescence, floral arrangement, floral morphology of Rice. 2. Studies of inflorescence, floral arrangement, floral morphology of Soybean. 3. Studies of inflorescence, floral arrangement, floral morphology of Sunflower. 4. Survey, Collection and submission of different crops seeds. 5. Exercise in field area measurement and field map preparation. 6. To study procedure of seed sample registration in Seed Testing Laboratory (STL) 7. Filling of application form for seed certification. 8. Preventive measures for seed borne pathogens. 9. Study of bacterial disease. 10. Study of fungal disease. 11. Study of insect pest (any two) 12. Study of grain pests – Rust red flour beetle. 	3 hrs /pract.

	13. Study of grain pests Khapra beetle. 14. Study of grain pests – Saw toothed beetle. 15. Visit to Entomology Department.	
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Course Outcome : Student should be able to:

1. prepare the field area map.
2. make survey collection and identification of various crop seeds from the field.
3. identify types of seeds-borne disease.
4. perform seed viability tests.

References:

1. Agrawal, (2018) Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
2. Joshi AK, and Singh BD, (2017). Seed Science and Technology; Edition. Revised; Publisher. Kalyani Publishers.
3. Hutchins JD, and Reeves JE, (Eds.). (1997). Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.
4. Agarwal VK, and Sinclair JB, (1993). Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi.

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B. Sc. Part – II

Semester- III

BSP - 234

PRACTICAL COURSE–Based on BSP-232

Course Objectives: Student will be able to:

- 1) know the practical knowledge about monocot and dicot seeds.
- 2) understand the practical knowledge about germination testing .
- 3) know seed borne pathogens.
- 4) understand the seed viability tests.

Credits-2	SEMESTER-III BSP: 23	No. of hrs/unit/ credits
	Practical's Group B based on BSP 232 1. Study of the structure of monocot. 2. Study of the structure dicot seeds. 3. Germination testing by the paper method. 4. Germination testing by the paper towel method. 5. Seed viability test by TTC method. 6. Study of seed-borne pathogens (Any five). 7. Microscopic examination of dry seeds for disease symptoms. (Any five). 9. Seed treatment by hand rotary duster. 10. Peroxidase and GA tests of any seeds. 11. Study of NaOH test for genetic purity. 12. Study of seed borne diseases (any two)	3hrs/pract.

	<p>13. Study of GA test for seed.</p> <p>14. Study of germination of seeds by using growth parametrs. (Germination percentage, Root length, Shoot length, Root-Shoot Ratio)</p> <p>15. Visit to seed testing laboratory.</p>	
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Course Outcome : Student should be able to:

1. perform germination of seeds by different methods.
2. identify different seed borne pathogens.
3. perform seed viability tests.
4. aware about seed testing.

References:

1. Agrawal, (2018) Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
2. Joshi AK, and Singh BD, (2017). Seed Science and Technology; Edition. Revised; Publisher. Kalyani Publishers.
3. Hutchins JD, and Reeves JE, (Eds.). (1997). Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.
4. Agarwal VK, and Sinclair JB, (1993). Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi.

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B.Sc.Part-II:Seed Technology-Minor

Semester-III

Course BBST 235 –Principles of Seed Pathology

Learning Objectives:Students will be able to:

1. understand the basic knowledge about seed pathology.
2. know the knowledge of the effect of pathogens on seed-borne disease development.
3. impart the knowledge about principles of seed-borne disease management.
4. know about the quarantine for seeds.

Credits-2	Semester-III-Course BBST 235	No.of hrs/unit/ credits
Unit-I	Unit-I: Seed borne diseases	(07)
	1.1 History of seed pathology and economic significance of seed borne diseases. 1.2 Seed borne fungi, bacteria, viruses and nematodes .(Any two examples of each group.) 1.3 Inoculum density of seed borne pathogens and its relationship with disease security, yield losses. 1.4 Ecological relationship of seedborne microorganisms.	
UNIT- II	Unit-II:Seed infection	(08)
	2.1 Storage fungi and their impact on animal and human health. (Suitable examples) 2.2 Mechanisms of transmission of seed pathogen. 2.3 Entry points of seed infection. 2.4 Influence of environmental factors on seed borne diseases.	

	Unit-III: Seed treatment	
UNIT- III	3.1 Seed treatment, procedures, and equipment's. 3.2 Objectives of seed health testing, procedures of sampling methods of seed health testing.	(07)
	Unit – IV: Seed Legislation	
UNIT- IV	4.1 Quarantine for seed. (Principle and procedure) 4.2 Seed certification and tolerance limits of seed borne pathogens. 4.3 Seed act in relation to seed borne diseases.	(08)

CourseOutcome:Students should be able to:

1. explain the seed infection.
2. discuss the storage of fungi and their impact on animal and human health.
3. analyze about seed treatment.
4. describe the process of seed certification.

References:

1. Agrawal, (2018).Edition, reprint, revised; Publisher,Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949.
2. Chopra V. L. (2001). Plant Breeding Field crops Oxford IBH Pvt. Ltd. New Dehli.
3. AgarwalVK,andSinclairJB,(1993).PrinciplesofSeedPathology.Vols.IandII,CBSPubl.,New Delhi.
4. PaulNeergaard.,(1988). SeedPathology.MacMillan,LondonSuryanarayanaD., (1978).Seed Pathology.VikashPubl.,New Delhi.
5. AgarwalRN.,(1982).SeedTechnology;Author, R.L.Agrawal;Publisher,Oxford,andIBHPublishing.
6. HutchinsJD,andReevesJ. E,(Eds.).(1997).SeedHealthTesting:ProgressTowardsthe21st Century. CABI, Wallington.

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B. Sc. II Seed Technology -Minor

BSP - 236

**Principles of Seed Pathology
Semester- III**

PRACTICAL COURSE–Based on BSP 235

Course Objectives : Students will be able to:

1. know the practical knowledge about methods of seed-borne disease.
2. understand the practical knowledge about various methods of seed treatment.
3. employ various techniques in different experimental aspects of seed pathology.
4. understand the plant-originated insecticides.

Credits-2	SEMESTER-III BSP: 236	No. of hrs/unit/ credits
	<ol style="list-style-type: none">1. Different methods of examination of seeds to assess seed-borne microorganisms.2. Quantification of infection percentage in seed borne.3. Detection of seed-borne fungi.4. Seed treatment methods.5. Role of seed pathology in seed industry and plant quarantine.6. Testing physical purity.7. Germination and moisturegrow-out tests for pre and post-harvest quality control.8. Study of chemical methods to control seed-borne pathogens.9. Study of seed certification agency.	(15)

	<p>10. Study of plant-originated insecticides.</p> <p>11. Preparation of PDA culture media.</p> <p>12. Isolation and identification of seed-borne fungi.</p> <p>13. Study of seed health testing.</p> <p>14. Study of seed viability testing.</p> <p>15. Visits to regulatory seed testing laboratory.</p> <p>16. Visit to plant quarantine lab.</p>	
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Course Outcome: Student should be able to:

1. prepare PDA culture media.
2. identify seed-borne pathogens.
3. prepare plant-originated insecticides.
4. perform the seed viability tests.

References:

1. Agrawal, (2018). Edition, reprint, revised; Publisher, Oxford and IBH Publishing Company Pvt. Limited; ISBN, 8120409949
2. Chopra V. L. (2001). Plant Breeding Field crops Oxford IBH Pvt. Ltd. New Delhi.
3. Hutchins JD, and Reeves JE, (Eds.). (1997). Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.
4. Agarwal VK, and Sinclair JB, (1993). Principles of Seed Pathology. Vols. I and II, CBS Publ., New Delhi.
5. Paul Neergaard., (1988). Seed Pathology. MacMillan, London.
6. Agarwal RN., (1982). Seed Technology; Author, R.L. Agrawal; Publisher, Oxford, and IBH Publishing.
7. Suryanarayana D., (1978). Seed Pathology. Vikash Publ., New Delhi.

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B. Sc. II Seed Technology

Vocational Skill Course (VSC)

Seed Bank

Semester III

PRACTICAL COURSE- BBSTPVSC - I

Course Objectives: Student will be able to:

1. know the practical knowledge about dicot seeds
2. understand the practical knowledge about dry seeds observation.
3. Imbibes the knowledge of percentage of germination.
4. Understand the seed viability.

Credits=2	SEMESTER-III BSP:	No. of hrs/unit/ credits
	<ol style="list-style-type: none">1. Study of Dicot seeds.2. Study of monocot seeds.3. Cleaning of various types of seeds by physical purity analysis.4. Identification of seeds and crop plants at different growth stages.5. Drying of seeds by different methods.6. Preservation of various types of seeds by different methods.7. Identification of different tillage implements.8. Identification of fertilizers and pesticides.9. Identification of weeds from different field crops.10. Determination of purity and germination percentage of seed, Methods of seed germination.11. To study the effect of seed size on germination and seedling vigour of kharip season crops.12. Identification of tools and implements used in landscaping	3 hrs /pract

	gardening. 13. Study of traditional methods of seed storage. 14. Study of modern methods of seed storage. 15. Collection of different types of seeds for seed bank formation. 16. Study of seed viability in agricultural crops. 17. Study of seed viability in horticultural crops. 18. Methods of seed drying- Sun drying (Natural Drying). 19. Methods of seed drying Forced air drying (Mechanical drying). 20. Use of desiccants (Chemical) for drying.	
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Course Outcome: Student should be able to:

1. Differentiate between dicot and monocot seeds.
2. Implement the different tillage practices in field.
3. Plan and design seed viability tests for horticultural crops.
4. Perform the knowledge of seed drying by various methods.

References:

1. Gupta, O.P. (2008), Modern Weed Management Agribios India Publication
2. Chhidda Singh, Modern techniques of raising field crops. Oxford and IBH Publishing Co. Ltd., Bangalore.
3. Gopal Chandra De. (1980). Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.
4. Handbook of Agriculture, ICAR Publication.
5. Palaniappan, S.P., Cropping Systems in the tropics—Principles and Practices.
6. Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India.
7. Sankaran, S and Subbiah Mudliyar, V.T., (1991). Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
8. Vaidya, V. G., Sahasrabudhe, K. R. and Khuspe, V. S. Crop production and field experimentation. Continental Prakashan, Vijaynagar, Pune.

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**B. Sc. II Seed Technology
Skill Enhancement Course (SEC)**

Seed Processing Technology

Semester III

BBSTPSEC-2

PRACTICAL COURSE

Course Objectives: Student will be able to:

1. gain the practical knowledge of orthodox and recalcitrant seeds
2. understand the practical knowledge about seed germination and storability of seeds.
3. learn the techniques of seed processing.
4. Know the seed extraction methods.

Credits=2	SEMESTER-III BSTPSEC-2	No. of hours per unit/ credits
	<ol style="list-style-type: none">1. Effect of drying temperature and duration on seed germination and storability with particular reference to oil seeds.2. Operation and handling of mechanical drying equipment.3. Study of orthodox, intermediary, and recalcitrant seeds.4. Study of seed –pre-cleaner,maizesheller&dehusker.5. Study of air screen cleaner cum grader.6. Study of magnetic separator.7. Study of specific gravity separator.8. Study of seed treatment machines.9. Study of seed packaging equipment.10. Study of bucket elevators, screw conveyors, and pneumatic elevators.11. Study of seed extraction methods.12. Study of seed quality parameters – purity and viability.13. Study of seed health and seed vigor.	3hrs/prac

<p>14. Study of germination from different seed samples.</p> <p>15. Study of grading of seed lots as per National standards.</p> <p>16. Study of handling of instruments used in seed testing laboratory.</p> <p>17. Study of seed and seedling vigor tests applicable in various crops.</p> <p>18. Study of specifications for tags and labels to be used for certification purposes.</p> <p>19. Study of grow-out tests for pre and post-harvest quality control.</p> <p>20. Visit the seed processing plant and seed stores.</p>	
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Course Outcome: Student should be able to:

1. perform seed germination methods.
2. differentiate between the orthodox, intermediary, and recalcitrant seeds
3. analyze the seed health and seed vigor.
4. handle the use of different seed processing equipment.

References:

1. Khare Dharendra and Bhale Mohan S,(2000). Seed Technology. Scientific Publ. India.
2. Sahay KM and Singh KK, (1991). Unit Operations in Food Engineering. Vikas Publ.
3. Agrawal PK, and Dadlani M, (1995). Techniques In Seed Science And Technology (2nd Ed.) South Asian Publ. New Delhi.
4. Copeland RA,(1996). Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis. VCH Publishers, New York.
5. Agrawal RL,(1997). Seed Technology (IInd Ed.) Oxford & IBH Publ. Co. Daryaganj, New Delhi.
6. Desai BB, Kotecha PM and Salunkhe DK,(1997). Seeds Handbook. Marcel Decker Inc., New York
7. Mc Donald MB (1997). Seed Production: Principles and Practices.
8. Barton LV,(1985). Seed Preservation and Longevity. International Books and Periodicals Supply Service, New Delhi. Chakravarty, A. Post Harvest Technology of Cereals, Pulses and Oil Seeds.
9. Justice OL and Bass LN,(1978).Principles and practice of seed storage. USDA Agricultural Handbook no. 506, Washington. Castle House Pub. Ltd.
10. Viridi SS and Gregg BG,(1970). Principles of Seed Processing. National Seed Corp., New Delhi
Simmonds NW,(1979). Principles of Crop Improvement, Longman, London and New York.

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B. Sc. II Seed Technology

Vocational Skill Course (VSC)

Semester III

Seed Technology (Major)

BSTP-VSC-I : Environmental Studies in Seed Technology

Course Objectives:The students should be able to:

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

Credits (02)	VEC Course -II (BBT-VEC-II) : Environmental Awareness for Plant Scientist	No. of hours per unit
Unit I	Environmental issues	08
	1.1Pollution (Air, Water, and Land), 1.2 Fresh-water overuse, 1.3 Natural disasters, 1.4 Fuel and Energy shortage due to overuse, 1.5 Increase in wasteland, 1.6 Biodiversity loss, 1.7 Global warming and climate change (Causes and intensity of the problem), 1.8 role of Seed Technology in the creation of environmental issues	
Unit II	Environmental laws and ethics	07
	2.1 Environmental Protection Act 2.2 Wildlife Protection Act 2.3 Forest Conservation Act 2.4 Prevention and Control of Pollution Act (Air, water and Land),2.5 From	

	unsustainable to sustainable development, 2.6 Responsibilities of an Environmentally Aware Citizen.	
Unit III	Sustainable Development Goals	07
	17 global sustainable goals	
Unit IV	Role of Plant Sciences in meeting the sustainable development goals.	08
	Examples and case studies	

Course Outcomes:The students will be able to:

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

References Books:

1. Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001 Ravikrishnan A., Environmental Science and Engineering — Anna University of technology, Tindivanam.
2. Samant J. S., Environmental Studies – Shivaji University Kolhapur.
3. Bharucha Erach, Environmental Studies - University Grants Commission New Delhi, and Bharati Vidyapeeth Institute of Environment Education & Research, Pune.
4. Agarwal, K.C., Environmental Biology, Nidi Pub. Ltd., Bikaner (2001).
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SEMESTER - IV

Karmaveer Bhaurao Patil University, Satara

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2024

B. Sc. Part–II - (Major)

BBST - 241

Recent Trends in Seed Production

Course objectives: Students will be able to:

1. understand the basic knowledge of plant breeding
2. imbibe the knowledge of the effect of heterosis.
3. understand the knowledge about male sterility and self-incompatibility in crops.
4. gain knowledge about recent advances in plant breeding about seed production.

Credits=4	SEMESTER-IV BBST 241 :Recent Trends in Seed Production	No. of hrs/unit/credits
	Unit-I: Heterosis and inbreeding depression	
Unit-I	1.1 Introduction of Heterosis 1.2 Genetic basis of heterosis 1.3 Type of heterosis 1.4 Commercial exploitation of heterosis 1.5 Introduction of inbreeding depression 1.6 Genetic basis of inbreeding depression 1.6 Commercial utilization	(08)
	Unit-II: Male sterility	

UNIT-II	2.1 Definition and types of male sterility 2.2 GMS – Introduction and its uses 2.3 CMS – Introduction and its uses 2.4 C-GMS – Introduction, seed production of A, B and R-lines 2.5 Environmental sterility 2.6 Induction and application of male sterility	(07)
	Unit-III: Self incompatibility	
UNIT-III	3.1 Definition, genetic basis of self-incompatibility, types of incompatibility, merits and demerits. 3.2 Methods of breaking incompatibility (pollen irradiation, application of NAA and IAA).	(07)
	Unit-IV: Biotechnological applications	
UNIT-IV	4.1 Haploid production 4.2 Somaclonal variation 4.3 Embryo rescue 4.4 Synthetic seed production and cybrids 4.5 GM crops (Bt cotton)	(08)

Course outcomes: Students are able to:

1. explain the concept of heterosis, inbreeding depression, and its applications in crop improvement
2. describe the concept of male sterility and its application.
3. discuss about the self-incompatibility and its application.
4. analyze the different stages of growth in plants.

References:

1. Chawla HS (2011): Plant Biotechnology: Theory and Practice.
2. Singh BD (2010): Plant Biotechnology.
3. Singh Prem and Arya (2009). Vegetable breeding and seed production. Kalyani Publ. Ludhiana.
4. Singh, BD (2006) Plant Breeding 2nd Ed. Kalyani Publ. Ludhiana Chopra L (2001) Plant Breeding of Field Crops. Oxford IBH Pvt. Ltd. New Dehli.

Karmaveer Bhaurao Patil University, Satara

Yashwantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2024

**B. Sc. Part–II (Major) BBST-242
Seed Biotechnology**

Course objectives : Students will be able to:

1. Impart the basic knowledge of biotechnology.
2. Gain the knowledge of the tools and techniques in tissue culture.
3. Understand the knowledge about the embryo culture.
4. Learnt the applications of plant tissue culture.

Credits-2	SEMESTER-IV BBST 242:Seed Biotechnology	No. of hrs/unit/cr redits
	Unit-I: Introduction to Biotechnology	
Unit-I	1.1 Introduction, Definition, history of Biotechnology 1.2 Scope of Biotechnology in conservation of quality seed and their improvement. 1.3 Tools and techniques of tissue culture. 1.4 Different culture methods and regeneration protocols for plants.	(07)
	Unit-II:Procedure in tissue culture	
UNIT-II	2.1 Preparation of media. Plant hormones and their role in development. 2.2 Fumigation, Wet and dry sterilization, Ultraviolet sterilization, 2.3 Ultra filtration and surface sterilization. 2.4 Laminar flow hood, Maintenance of axenic cultures, Explants for Tissue culture: Totipotency, Shoot tip, axillary buds, leaf disc etc.	(08)

	Unit-III:Problems encountered in genetic conservation	
UNIT-III	3.1 Embryo culture, Plant material and callus principles and technique. 3.2 In vitro flowering, Anther and pollen culture production of dihaploides and their utility. 3.3 Production and maintenance disease free clones through tissue culture.	(07)
	Unit-IV:Applications of Plant Tissue Culture	
UNIT-IV	4.1 Plant improvement for agriculture, horticulture and forestry. 4.2 Production of secondary metabolites. 4.3 Preservation of plant genetic resources and germplasm conservation.	(08)

Learning outcomes:Students are able to:

1. Explain concepts of seed biotechnology.
2. Define the concepts of tissue culture.
3. explaintheembryoculture.
4. Start the plant tissue culture laboratory.

References:

1. SharmaK.V. S. (2002).Statistics made simple :Do it yourself on PC, PHI.
2. Levin B.(2000). GenesVII,Oxford Uni.press.
3. Allard R.D. (1999). Principles of Plant Breeding, John Wiley and Sons, Inc.
4. Purohit S. S. (1999). Agricultural Biotechnology.Agro Botanica.India
5. Reinert J. R. and Bajaj Y.P.S. (1997). Applied and fundamental aspects of plant cell, tissue, and organculture. Springer and Verlag, Berlin.
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7. Poehlmann M.(1959). Breeding of field crops, Henry Holtand Co., New York.

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Yashwantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2024

B. Sc. Part – II

Semester-IV

BSP 243

PRACTICAL COURSE–Based on BSP-241

Course Objectives: Student will be able to:

1. know the practical knowledge about the various methods involved in crop improvement.
2. understand the practical knowledge about seed biotechnology.
3. know the techniques of GM Crops.
4. Learn the techniques of sterilization.

Credits=2	SEMESTER-IV BSP:243	No. of hours per unit/ credits
Credit-I	<ol style="list-style-type: none">1. Study of breeder's kit.2. Emasculation of various crops. (Maize, Cotton, Wheat).3. Studies of protogynous and protandrous flowers in Jowar and sunflower.4. Study of pollen viability.5. Study of Structure of pollen grain.6. Study of pollen germination.7. Preparation of culture medium (M.S.).8. Study of techniques of sterilization.9. Demonstration of GM crops using suitable example (BT Cotton).10. Micro-propagation of plants by nodal and shoot tip culture.11. Study of tissue culture technique.12. Study of Embryo culture13. Preparation of Media culture14. Study of sterilization techniques.15. Study of plant hormones (Auxin, Cytokinin).16. Visit to Biotechnological lab.	3 hrs/Practical

Course Outcome: Student should be able to:

1. perform the breeding techniques.
2. gain the techniques of sterilization.
3. prepare the MS media.
4. make synthetic seeds.

References:

1. Gamborg, O.L and G.C.Philips (eds.). 2013. Plant Cell, Tissue and Organ culture Lab Manual. Springer Science & Business media.
2. Bhojwani, S.S and Dantu, P. (2013). Plant Tissue Culture – An Introductory Text. Springer Publications
3. Herman, E. B., (2008) Media and Techniques for Growth, Regeneration and Storage, Agritech Publications, New York, USA
4. Razdan, M. (2003) Introduction to plant tissue culture, 2nd edition, Oxford publications group.
5. Butenko, R. G. (2000) Plant Cell Culture University Press of Pacific

Karmaveer Bhaurao Patil University, Satara

Yashwantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2024

B. Sc. Part – II

Semester-IV

BSP 244

PRACTICAL COURSE–Based on BSP 242

Course Objectives: Student will be able to:

1. know the practical knowledge of MS media.
2. understand the various techniques of sterilization..
3. know the techniques of somatic embryogenesis.
4. understand the techniques of ovule culture.

Credits=2	SEMESTER-IV BSP:243	No. of hours per unit/ credits
Credit–2	<ol style="list-style-type: none">1. Nutrient media composition, preparation and sterilization.2. Selection of explants.3. Establishment and maintenance of different types of plant cultures for callus induction and regeneration.4. Initiation and establishment of suspension cultures.5. Micropropagation on of monocot plants via axillary shoot Proliferation.6. Micropropagation via adventitious shoot proliferation.7. Micropropagation on of dicot plants via axillary shoot Proliferation.8. Micropropagation via somatic embryogenesis.9. Preparation of synthetic seeds.10. Study of Anther/microspore culture.11. Study of Embryo/ovuleculture.12. Preparation of MS media.13. Study of techniques of sterilization.14. Study of hardening of plants.15. Instruments used for tissue culture.	3 hrs/Prcatical

Course Outcome: Student should be able to:

5. prepare nutrient media.
6. gain the techniques of sterilization.
7. prepare the MS media.
8. make synthetic seeds.

References:

6. Gamborg, O.L and G.C.Philips (eds.). 2013. Plant Cell, Tissue and Organ culture Lab Manual. Springer Science & Business media.
7. Bhojwani, S.S and Dantu, P. (2013). Plant Tissue Culture – An Introductory Text. Springer Publications
8. Herman, E. B., (2008) Media and Techniques for Growth, Regeneration and Storage, Agritech Publications, New York, USA
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10. Butenko, R. G. (2000) Plant Cell Culture University Press of Pacific

Yashavantrao Chavan Institute of Science, Satara(AnAutonomous)

B. Sc. Part-II:Seed Technology-Minor

Semester–IV

Course BBST-245 –Techniques to Improve Seed Production

Learning Objectives:Students will be able to:

1. know the basic techniques to improve seed production.
2. understand the principles of hybrid seed production.
3. gain the knowledge of the agronomy of seed production.
4. understand the knowledge of male sterility and self-incompatibility.

Credits-2	Semester-IV-Course BST-245	No. of hrs/unit/ credits
Unit-I	Unit–I: Importance of Seed	(07)
	1.1 Introduction: Seed as basic input in agriculture; seed development in cultivated plants; seed quality concept and importance of genetic purity in seed production; 1.2 types of cultivars, their maintenance and factors responsible for deterioration, seed production in self- and cross-pollinated crops. 1.3 Planning of seed production for different classes of seeds for self- and cross-pollinated crops, seed quality control system and organization, seed village concept; 1.4 Seed production agencies, seed industry and custom seed production in India.	
UNIT-II	Unit-II:Principles of Hybrid Seed Production	(08)
	2.1 Mode of pollination and reproduction in crop plants and their modification in relation to hybrid seed production. 2.2 Principles of hybrid seed production, isolation distance, synchronization of flowering, rouging etc. 2.3 Male sterility and incompatibility system in hybrid seed production.	

	2.4 Role of pollinators and their management.	
UNIT-III	Unit-III: Seed Multiplication and Propagation	(07)
	3.1 Seed multiplication ratios, seed replacement rate, demand and supply.	
	3.2 Suitable areas of seed production and storage, agronomy of seed production – agro climatic requirements and their influence on quality seed production.	
	3.3 Seed – criteria involved; life span of a variety and causes for its deterioration.	
	3.4 Certification standards for self and cross pollinated and vegetatively propagated crops.	
	Unit – IV: Hybrid Seeds	
UNIT-IV	4.1 Hybrid Seed – Methods of development of hybrids.	(08)
	4.2 Use of male sterility and self-incompatibility and CHA in hybrid seed production.	
	4.3 One-, two- and three-line system; maintenance of parental lines of hybrids.	
	4.4 Planning and management of hybrid seed production technology of major field crops and vegetables.	

Course Outcome : Student should be able to:

1. explain the self and cross-pollinated crops.
2. discuss the role of pollinators.
3. describe agronomy of seed production.
4. define the methods of hybrid seeds.

References:

1. Poehlman J. M & Sleper D. A. (2006). Breeding Field Crops. Blackwell.
2. Chhabra AK. (2006). Practical Manual of Floral Biology of Crop Plants. Dept. of Plant Breeding CCS HAU, Hisar
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3. Singh BD. (2005). Plant Breeding: Principles and Methods. Kalyani.
4. Desai BB. (2004). Seeds Handbook. Marcel Dekker McDonald MB Jr & Copeland LO. (1997).

Seed Production: Principles and Practices.

5. .Singhal NC. (2003). Hybrid Seed Production in Field Crops. Kalyani.
6. .Kelly AF. (1988). Seed Production of Agricultural Crops. Longman.
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8. Thompson JR. (1979). An Introduction to Seed Technology. Leonard Hill.
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Karmaveer Bhaurao Patil University, Satara

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2024

B. Sc. II Seed Technology-Minor

Techniques to improve Seed Production

Semester- IV

BBSTP-246

PRACTICAL COURSE

Course Objectives:Students will be able to:

1. get practical knowledge about high-quality planting materials.
2. get the practical knowledge about floral biology.
3. get the emasculation technique.
4. get the seed processing techniques.

Credits=2	SEMESTER-IV BBSTP : 246	No. of hours per unit/ credits
	<ol style="list-style-type: none">1. Selection of suitable areas/locations for high quality seed/planting material production.2. Study of floral biology of vegetables.3. Determination of planting ratios for hybrid seed production vegetables.4. Use and maintenance of monoecious line in hybrid seed production of cucumber.5. Exercises on emasculation and pollination.6. Seed extraction methods and their effect on quality of vegetables.7. Seed production technology of varieties and hybrids in vegetables.8. Planning of Seed Production, requirements for different classes of seeds in field crops - unit area and rate.9. Seed production in cross pollinated crops with special reference	3hrs/pract

	<p>to land, isolation, planting ratio of male and female lines.</p> <p>10. Supplementary pollination, pollen storage, hand emasculation.</p> <p>11. Pollination in Cotton, detasseling in Corn.</p> <p>12. Identification of rogues and pollen shedders.</p> <p>13. Pollen collection, storage, viability and stigma receptivity.</p> <p>14. Gametocide application.</p> <p>15. Germination test: Effect of light, temperature and growth hormones.</p> <p>16. Yield analysis: crop and seed.</p> <p>17. Processing techniques: collection, drying, grading, packing and storage.</p> <p>18. Vegetative propagation and in-vitro multiplication techniques.</p> <p>19. Effects of priming; methods for hydrogel encapsulation of artificial endosperm, hydrophobic coating.</p> <p>20. Visits to seed production plots</p>	
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Course Outcome: Student should be able to:

1. prepare the hybrid varieties of crops.
2. describe the floral biology of crops.
3. identify the viability of pollen grains.
4. perform the seed priming.

References:

1. Chapman & Hall. Singhal NC. (2003). Hybrid Seed Production in Field Crops. KalyaniChapman & Hall.
2. Singh SP. (2001). Seed Production of Commercial Vegetables. Agrotech Desai BB. (2004). Seeds Handbook. Marcel Dekker.
3. Miller, B. McDonald and Lawrence O. Copeland, (1998). Seed Production: Principles and Practices. CBS publishers and distributors, 11 Darya Ganj, New Delhi.
4. McDonald MB Jr& Copeland LO. (1997). Seed Production of Crops: Principles and Practices.
5. McDonald MB Jr& Copeland LO. (1997). Seed Production: Principles and Practices.
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8. Kelly AF. (1988). Seed Production of Agricultural Crops. John Wiley.

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Karmaveer Bhaurao Patil University, Satara

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June - 2024

B. Sc. II Seed Technology

Vocational Skill Enhancement Course (SEC)

Seed Aesthetics

Semester-IV

BBSTPSEC-2

PRACTICAL COURSE

Course Objectives : Student will be able to:

1. Get the practical knowledge about seed ornaments.
2. Get practical knowledge about seed jewelry.
3. understand techniques for the beautification of seeds.
4. Understand the importance of seeds for ornamental purposes.

Credits=2	SEMESTER-IV BBSP:BSTPSEC-3	No. of hrs/unit/ credits
	<ol style="list-style-type: none">1. Study of types of monocot seeds.2. Study of types of monocot seeds.3. Study of types of seeds based on ornamentation.4. Field visits nearby area for collection of different types of seeds.5. Preparation of ornaments Bracelets.6. Preparation of ornaments Bangles.7. Preparation of home decorators by using seeds.8. Role of seed aesthetics in sustainable development.9. Study of use of seeds in various festivals (Diwali, Ghatsthapana, Ganpati).10. Study of use of seeds in various ceremonies (Marriage) decoration.11. Study of use of seeds in various festivals (Makarsankranti, Gudi Padawa).	3hrs./Pract.

	12. Study of use of seeds in various ceremonies (Naming ceremony) decoration. 13. Study of preservation methods of ornaments for long shelf life. 14. Study of preservation methods of home decors for long shelf life. 15. Submission of seed ornaments.	
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Course Outcome: Student should be able to:

1. Perform seed jewelry.
2. Differentiate between aesthetic seeds.
3. prepare seed ornaments.
4. perform the preservation techniques for the shelf life of seed ornaments.

5. References:

1. Michelle Lorena (2024). Feathered Finery: Crafting Profitable Bird Seed Ornament Designs
2. Nandan,H. (2013). Fundamentals of Entrepreneurship, PHI Learning Pvt.Ltd.
3. Frederick G. Crane, (2012). Marketing for Entrepreneurs: Concepts and Applications for New Ventures SAGE Publications.
4. Hutchins, Ross E. (1965). The Amazing Seeds New York: Dodd Mead.

Karmaveer Bhaurao Patil University, Satara

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June- 2024

B. Sc. II Seed Technology

Skill Enhancement Course (SEC)

Seed Health Technology

Semester-IV

BBSTPSEC-3

Course Objectives: Student will be able to:

1. get the practical knowledge about common crops
2. get the practical knowledge about seed production technology
3. know the seed quality measurement.
4. understand the pollen morphology and germination.

Credits-2	SEMESTER-IV BBSTPSEC-3	No. of hours per unit/ credits
	<ol style="list-style-type: none">1. Detection of seed-borne fungi of some common crops (Maize, Soybean) by any incubation method.2. Seed production technology of cucurbits, solanaceous vegetables, and cole crops in open, under poly-house & low tunnel.3. Crossing & emasculation and pollination systems in different vegetable crops.4. Seed production techniques of cauliflower, peas, French bean, winter bean, Dolichos bean, okra, onion, brinjal, chili, capsicum, carrot, turnip, and radish.5. Study some common weeds of crop plants and crop seed nurseries6. Study the garden soil characteristics (pH, bulk density, water holding capacity) by any method.7. Description and chemical formula of some recommended seed	(15)

	<p>fungicides and insecticides using charts/photographs.</p> <p>8. Seed quality measurement viz. physical and genetic purity testing, Identification of weed seeds, germination and vigour testing, moisture testing and seed health testing.</p> <p>9. Study of pollen grains – pollen morphology, pollen germination and pollen sterility.</p> <p>10. Types monocot and dicot embryos; external and internal structures of monocot and dicot seeds.</p> <p>11. Seed production in rice and maize (varieties and hybrids).</p> <p>12. Emasculation and pollination in bitter melon and brinjal.</p> <p>13. Visit of seed production plots of field crops and vegetables. Seed coat structure.</p> <p>14. Pollen storage, hand emasculation and pollination in cotton.</p> <p>15. Relationship between seed borne infection and expression of the disease in the field.</p> <p>16. Preparation of seed albums and identification. Pollination in hybrid seed production plots of rice and maize,</p> <p>17. Visit to seed production companies and certification agencies.</p> <p>18. Visit to seed processing units.</p> <p>19. Estimation of carbohydrates, proteins, fats, enzyme activities.</p> <p>20. Plant protection equipment's, their operation and maintenance.</p> <p>21. Hybrid seed production in different flower crops like marigold, petunia, antirrhinum, zinnia, pansy, lupin, calendula, phlox, vinca, dianthus, sunflower, annual chrysanthemum etc.</p>	
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Course Outcome: Student should be able to:

1. identify seed born fungi.
2. perform the seed production technology.
3. differentiate the characters of garden soil.
4. utilize the knowledge of seed production companies.

References:

1. Boca Raton. Karuna, V. (2007). Seed Health Testing.

2. Desai, B.B. (2004). Seeds Hand book. Marcel Dekker.
3. Singhal, N.C. (2003). Hybrid Seed Production in Field Crops. Kalyani Publishers, N. Delhi.
4. Agarwal, V.K. and Sinclair, J.B. (1997). Principles of Seed Pathology.
5. Agarwal, R.L. (1997). Seed Technology. 2nd Ed. Oxford & IBH.
6. McDonald, M.B. Jr and Copel and, L.O. (1997). Seed Production: Principles and Practices.
7. Kalyani. Neergaard, P. (1988). Seed Pathology. Mac Millan
8. Kelly, A.F. (1988). Seed Production of Agricultural Crops. Longman.
9. Chapman and Hall. Musil, A.F. (1967). Identification of Crop and Weed Seeds. Handbook No. 219, USDA, Washington, D. C, USA.

B. Sc. II Semester – IV-
BOTANY, PLANT PROTECTION. AND SEED TECHNOLOGY-
COURSE NAME AND CODE : BBSTCC-2
COMMUNITY COMMUNICATION

Structure of NSS Course:

Duration	Theory Periods	Total Periods	Credits
1 Year	30	30	2

Semester – II

Course objectives: Students should be able to...

1. Know the basic concepts of NSS.
2. Realize the importance of NSS in Life.
3. Inculcate the awareness and preparation of basic of social important goals.
4. Improve personality.

Credits	Name of the units	No. of hours per unit
Total Credits 2		
Unit – I	Introduction to Basic concept of NSS	08
	1.1 Basic of NSS, The motto, Symbol, Badge, NSS song, aims and objective of NSS, 1.2 Classification of NSS programme.	

	1.3 Organisational structure, roles and responsibilities of various NSS functionaries.	
Unit – II	NSS Programmes and activities	07
	2.1 NSS Regular activities in adopted villages, Slums and with Voluntary Organisations. 2.2. Contributions of Special Camping Programm, Planning and preparation of special camping programme. 2.3 Guidelines for the success of Camp.Importance of successful camping programme. Organization,	
Unit III	Community gardening through NSS 3.1 Key benefits of community gardening, startup, Local resources, Common tree plantation, Save tree save nature, Public parks and its maintenance through people. Immunity boosting plant development. 3.2 Nursery development through public help. Budding, grafting. Layering etc. Medicinal plant development 3.3 Waste water management for gardening through community.	07
Unit IV	Sustainable agriculture through group farming. 4.1 Fruit plant nursery development. Vegetable crop nursery development through community. 4.2 Farm manuring, Vermicomposting project development through Community. 4.3 Save water, save nation through community. Conservation of native plant. Importance and conservation of native plant.	08

• **Course Outcomes:**

Student will be able to...

1. Apply NSS knowledge and Objectives.
2. Develop their interest in NSS and social service
3. Participated in social activity

4. Realize the rural development by GO and NGO'

References

1. Avhan Chancellor's Brigade – NSS Wing, Training camp on Disaster Preparedness Guidelines, March 2012
1. University of Mumbai National Service Scheme Manual 2009.
2. National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi
3. Rashtriya Seva Yojana Sankalpana – Prof. Dr. Sankay Chakane, Dr. Pramod Pabrekar, Diamond Publication, Pune