

University of Pune

**Three Year B. Sc. Degree Course in
SEED TECHNOLOGY (VOCATIONAL)**

**S.Y.B.Sc. SEED TECHNOLOGY Syllabus
(To be implemented from Academic Year 2014-15)**

Submitted by:
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Preamble:

Seed Technology is a 3-year B.Sc. Vocational Course approved by University of Pune. It is offered as one of the subjects among the four subjects (Seed Technology, Botany, Zoology and Chemistry) at the F.Y.B.Sc. level and among the three subjects (Seed Technology, Botany, Zoology or Chemistry) at S.Y.B.Sc. level. Two theory and one practical course (Seed Technology), along with four theory and two practical courses (Botany) are offered at the T.Y.B.Sc. level.

The course "Seed Technology" was introduced in 1994 only at Pravara Rural Education Society's Padmashri Vikhe Patil College of Arts, Science and Commerce, Pravaranagar, under the Vocationalization of first degree education scheme sanctioned by UGC which has fetched employment to most of the students in reputed seed industries. The course is coordinated and conducted by the Department of Botany

Introduction:

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. he cannot obtain the expected yields.

The 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 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 favourable 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 will concentrate on experimental practice, and theoretical aspects. This approach justifies the term 'vocational'.

The teaching centre at the college 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.

Objectives to be achieved:

- To promote the possibility of self employment after B.Sc / M.Sc Seed Technology
- 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

Eligibility

1. First Year B.Sc.:

Higher Secondary School Certificate (10+2) or its equivalent Examination with English and Biology (Pure Science), or Crop Science, or Crop Production, or Horticulture, or Dairy Science or Animal Husbandry. The student is supposed to take Botany, Zoology, Chemistry and Seed Technology as the subjects for the first year.

2. Second Year B.Sc.:

The students should pass in all subjects at the F.Y.B.Sc. level or at least in ATKT. In the second year the student is free to drop one subject either chemistry or Zoology.

3. Third Year B. Sc.:

The student should compulsorily clear all the subjects of First Year B. Sc. Seed Technology and keep terms (at least ATKT) of Second Year of B. Sc. with Seed Technology. Students who may have passed in all subjects at the S.Y.B.Sc. level, but have

not cleared all the courses at F.Y.B.Sc. level are not eligible to be admitted to the T.Y.B.Sc. It is mandatory for the students to take Botany and Seed Technology as subjects in the third year.

Admissions will be given as per the selection procedure / policies adopted by the respective college keeping in accordance with conditions laid down by the University of Pune.

Reservation and relaxation will be as per the State Government rules.

Standard of Passing

- i. In order to pass in the First Year Theory Examination, the candidate has to obtain at least 32 marks out of 80 (University Examination) and 8 marks out of 20 (Internal Examination) in each Theory Course.
- ii. In order to pass in the Second Year and Third Year Theory Examinations, the candidate has to obtain at least 16 marks out of 40 (University Examination) and 4 marks out of 10 (Internal Examination) in each Theory Course in each semester.
- iii. In order to pass in Practical Examination, the candidate has to obtain at least 32 marks out of 80 (University Practical Examination) and 8 marks out of 20 (Internal Practical Examination).

Award of Class

The class will be awarded to the student on the aggregate marks obtained during the Second and Third year in the Principle subject only. The award of the class shall be as follows:

1	Aggregate 70% and above	First Class with Distinction
2	Aggregate 60% and more but less than 70%	First Class
3	Aggregate 55% and more but less than 60%	Higher Second Class
4	Aggregate 50% and more but less than 55%	Second Class
5	Aggregate 40% and more but less than 50%	Pass Class
6	Below 40%	Fail

ATKT Rules

While progressing from F. Y. B. Sc. to S. Y. B. Sc. Class, the student has to pass in at least 8 courses (out of total 12).

While going from S. Y. B. Sc. to T. Y. B. Sc., the students should at least be in ATKT rule. The student will not be able to progress from S.Y.B.Sc. to T.Y.B.Sc. unless all his / her F. Y. B. Sc. courses are cleared.

Equivalence of Previous Syllabus

No equivalence required at S. Y. B. Sc. level, the course titles are same as previous syllabus.

External Students: There shall be no external students.

University Terms

Dates for commencement and conclusion for the First and Second Terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 80 percent attendance at theory and practical course and satisfactory performance during the term.

Medium of Instruction: The medium of instruction for the course shall be English.

Course Structure:

Duration: The duration of B.Sc. (Seed Technology) Degree Program shall be three years.

The syllabus has been structured to progressively inform and discuss the concepts and working areas of the seed industry. The training for skill sets required to perform the tasks in the industry has been concomitantly developed through the three-year course.

In the **First Year of undergraduate studies**, students will be given information about the Morphology of the crop plants, Testing for Cultivar Genuineness, Seed Physiology and Seed Production. A typical layout of the industry, equipment and operations, and regulations governing the industry are presented to the student. This information lays the foundation for detailed study of each facet in the progressive years. In the practical exercises, students will learn the basic techniques required in the industries.

In the **Second Year of undergraduate studies**, methods for Hybrid Seed Production, Seed Testing, Vegetable Seed Production and Seed Quality Control will be taught. The focus of these topics is to reveal to the students the different strategies used in hybrid seed production, ELISA tests, vegetable seed production and maintain the seed quality. The practical exercises use examples to explain the procedures described in the theory courses.

In the **Third Year of undergraduate studies**, the students of Seed Technology will have to study two theory courses and one practical course along with four theory courses and two practical courses of regular botany subject. In the two theory courses the students will go through the Seed Pathology and Entomology, Seed Farm Management, Processing and Storage, Entrepreneurship Development, Biotechnology and Intellectual Property Rights. The practical course will be dependent on the theory courses.

F. Y. B. Sc. Seed Technology

Paper	Course Title	Marks	Lectures
Paper - I	Morphology, Plant Breeding and Testing for Cultivar Genuineness	100 (80 + 20)	Three Lectures/Week per Paper (Total 36/Paper per Term)
Paper - II	Seed Physiology and Seed Production	100 (80 + 20)	
Practical Course	Practical Course	100 (80 + 20)	*Four Hours / Week (Total 96 – Term I & II)

Examination Pattern

Theory paper: University Examination – 80 marks (at the end 2nd term)
Internal Examination – 20 marks

Practical course: University Examination – 80 marks (at the end of 2nd term)
Internal Examination – 20 marks

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

- Question 1 8 sub-questions, each of 2 marks; answerable in 2 -3 line and based on entire syllabus
- Question 2 and 3 4 out of 6 – short answer type questions; answerable in 6 – 8 lines
- Question 4 2 out of 4 – long answer type questions; answerable in 12 – 16 lines
- Question 5 1 out of 2 – essay / long answer type question; answerable in 25 – 30 lines

Internal examination: Internal assessment of the student by respective teacher will be comprehensive and continuous, based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Types Questions, True / False, Definitions, and answers in two lines. There shall be 20 questions, each question of 0.5 marks.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of minimum 4 hours duration, carried over on two subsequent days. Certified journal along with visit report and submission is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination.

Setting question papers: Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject.

S. Y. B. Sc. Seed Technology

	Paper	Course Title	Marks	Lectures
Semester I	VOC- SETE -211	Hybrid Seed Production	50	Four Hours/Week per Paper (Total 48/Paper per Semester)
	VOC- SETE – 212	Seed Testing	50	
Semester II	VOC- SETE – 221	Vegetable Seed Production	50	
	VOC- SETE – 222	Seed Quality Control	50	
Semester I & II	VOC- SETE – 203	Practical Course	100	*Four Hours / Week (Total 96 – Semester I & II)

Examination Pattern

Theory paper: University Examination – 40 marks (at the end of each semester)
Internal Examination – 10 marks

Practical course: University Examination – 80 marks (at the end of 2nd semester)
Internal Examination – 20 marks

Theory examination will be of two hours duration for each theory course. There shall be 4 questions each carrying equal marks. The pattern of question papers shall be:

- Question 1 10 sub-questions, each of 1 marks; objective type and based on entire syllabus
- Question 2 2 out of 3 sub-questions, each of 5 marks; short answer type questions; answerable in 10 – 15 lines
- Question 3 1 out of 2 – long answer type questions; answerable in 20 – 25 lines
- Question 4 1 out of 2 – long answer type questions; answerable in 20 – 25 lines

Internal examination: Internal assessment of the student by respective teacher will be comprehensive and continuous, based on written test, 10 marks each semester. The written test shall comprise of objective type questions – Multiple Types Questions, True / False, Definitions, and Answer in two lines. Different sets of question papers may be given in the same class-room. There shall be 20 questions to be answered in 40 minutes, each question of 1 mark.

Practical Examination: Practical examination will be of minimum 4 hours duration, carried over on two subsequent days. Certified journal, submission of seed samples, visit report is compulsory for appearing for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

Setting question papers: Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject.

Theory Papers

	Paper	Paper Title	Marks	Lectures
Semester III	VOC- SETE- 335	Seed Pathology and Entomology	50	Four Hours/Week per Paper (Total 48/Paper per Semester)
	VOC- SETE- 336	Seed Farm Management, Processing and Storage	50	
	VOC- SETE- 345	Entrepreneurship Development	50	
	VOC- SETE- 346	Biotechnology and Intellectual Property Rights	50	
* Two theory courses of vocational seed technology along with four theory courses of regular Botany.				

Practical Courses

	Course	Course title	Marks	
Semester III & IV	VOC- SETE- 349	Based on Theory Courses: VOC-SETE-335, 336, 345 and 346.	100	*Four Hours / Week per course (Total 96/Course per Semester)
* One practical course of Seed Technology along with two practical courses of regular Botany subject.				

Examination Pattern

Theory paper: University Examination – 40 marks (at the end of each semester)
Internal Examination – 10 marks

Practical course: University Examination – 80 marks (at the end of 2nd semester)
Internal Examination – 20 marks

Theory examination will be of two hours duration for each theory course. There shall be 4 questions each carrying equal marks. The pattern of question papers shall be:

- Question 1 10 sub-questions, each of 1 marks; objective type and based on entire syllabus
- Question 2 and 3 2 out of 3 sub-questions, each of 5 marks; short answer type questions; answerable in 10 – 15 lines
- Question 4 1 out of 2 – long answer type questions; answerable in 20 – 25 lines

Internal examination: Internal assessment of the student by respective teacher will be comprehensive and continuous, based on written test, 10 marks each semester. The written test shall comprise of objective type questions – Multiple Types Questions, True / False, Definitions, Answer in two lines. Different sets of question papers may be given in the same class-room. There shall be 20 questions to be answered in 40 minutes, each question of 1 mark.

Practical Examination: Practical examination will be of minimum 6 hours duration, carried over on three subsequent days. There shall be 10 marks for laboratory log book and journal, 10 marks for viva-voce and minimum three experiments per practical course. Certified journals are compulsory for appearing for practical examination. There shall be one expert for each practical course and two examiners per batch; one of the examiners will be external.

Setting question papers: Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject.

Qualification of Teachers:

With minimum postgraduate degree in Botany (M. Sc. Cytogenetics and Plant breeding of Seed Technology) and qualified as per UGC regulations.

Course-wise details of the Syllabus

S. Y. B. SC. SEED TECHNOLOGY

S.Y.B.Sc. Semester I: (Voc-SETE-211) Paper-1: Hybrid Seed Production

Objectives:

1. To familiarize the students with Morphology Hybrid Seed Production technology.
2. To learn various conventional and non-conventional Hybrid Seed Production technologies.
3. To learn the principles and need for the production of hybrid seeds particularly in field crops.

Chapter-1: Heterosis and inbreeding depression. 3L

- 1) Definition
- 2) Genetic basis of Heterosis.
- 3) Genetic basis of inbreeding depression
- 4) Commercial utilization.

Chapter-2: Apomixis 3L

- 1) Definition
- 2) Types of apomixes
- 3) Significance.

Chapter-3: Male sterility 5L

- 1) Definition, types of male sterility.
- 2) GMS – Introduction and its use in hybrid seed production.
- 3) CMS- Introduction and its use in hybrid seed production.
- 4) C-GMS- Introduction, seed production of A,B and R-Lines.

Chapter-4: Self- incompatibility 2L

- 1) Definition
- 2) Kinds and utilization.

Chapter-5: Devices for hybrid seed production 4L

- 1) Manual Emasculation and hand / insect pollination.
- 2) Use of genetic male sterility.
- 3) Use of Gametocides.

Chapter-6: Basic principles of hybrid seed production 7L

- 1) Definition of variety and its type
- 2) Selection of site for seed production
- 3) Compact area approach,
- 4) Sowing, row spacing, fertilizer and irrigation.
- 5) Isolation, planting ratio and seed rate,
- 6) Roguing and pollen shedders.

Chapter-7: Pollination Biology 6L

- 1) Androecium- structure of stamen,
- 2) Fixation of anthers-cohesion and adhesion
- 3) Gynoecium-structure of carpel
- 4) Types of placentations.

- 5) Pollen viability
- 6) Pollen storage
- 7) Stigma receptivity

Chapter-8: Hybrid seed production of

18L

- 1) Maize
- 2) Bajra
- 3) Jowar
- 4) Cotton
- 5) Sunflower
- 6) Groundnut with respect to following points
 - i) Source of seed
 - ii) Selection of field (Land requirement)
 - iii) Isolation,
 - iv) Sowing
 - v) Cultural practices (Fertigation, Irrigation, plant protection)
 - vi) Roguing
 - vii) Harvesting and threshing.

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Umaraniet. al. 2006. *Experimental Seed Science and Technology, Agrobios, Jodhpur*
- Singh, 2009. *Plant Breeding: Principles and Methods. Kalyani Publishers, New Delhi*
- Agrawal, 2005. *Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Reddy, 2008. *Principles of crop production. Kalyani Publishers, New Delhi*
- Pandey, 2010. *A text book of Botany. S. Chand and Company Ltd., New Delhi*
- Santra and Chatterjee, 2007. *College Botany, New Central Book Agency (P) Ltd., Kolkata*
- Dutta, 1983. *A Class book of Botany, Oxford University Press, Calcutta*
- *Plant breeding-B.D Singh.*

S.Y.B.Sc. Semester I: (Voc-SETE-212) Paper-2: Seed Testing

Objectives:

1. To get familiarized with various National and International seed testing organizations such as ISTA, AOSA, CSTL and SSSL.
2. To learn about the important testing methods with regards to physical purity, germination percentage, moisture content, vigour, ODV etc. in seed.
3. To learn about the need, plan, layout and requirement for establishing a private seed testing laboratory.

Chapter-1: Introduction.	2L
1) Importance and history	
Chapter-2: Organizations and seed testing	4L
1) International seed testing Association	
2) Association of Official seed Analysts.	
3) Central seed testing Laboratory.	
4) State seed testing Laboratory.	
Chapter-3: Seed Testing Laboratory	6L
1) Introduction to ISTA	
2) Layout and Furnishing,	
3) Staffing.	
4) Equipments and their maintenance.	
Chapter-4: Seed Sampling	6L
1) Definition	
2) General principles of Sampling,	
3) Kinds and procedure of seed sampling.	
Chapter-5: Receipt and registration of samples	9L
1) Types of seed samples (Service, Certification and official sample),	
2) Precautions.	
3) Procedure of registration,	
4) Mixing and dividing samples,	
5) Heterogeneity test.	
Chapter-6: Physical purity analysis	5L
1) Definition of purity components	
2) Procedure	
3) ODV test	
4) Reporting and results.	
Chapter-7: Moisture Testing	4L
1) By air oven method	
2) Moisture meters.	
Chapter-8: Germination testing	7L
1) Definition and objectives,	
2) General principles and requirements,	
3) Procedure and methods (Paper, Sand and Soil)	
4) Seedling evaluation.	
Chapter-9: Seed Vigour testing	3L
1) Principle,	

2) General procedure.

Chapter-10: Reporting the results and storage of guard samples

2L

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Umarani *et. al.* 2006. *Experimental Seed Science and Technology, Agrobios, Jodhpur*
- Singh, 2009. *Plant Breeding: Principles and Methods. Kalyani Publishers, New Delhi*
- Agrawal, 2005. *Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Reddy, 2008. *Principles of crop production. Kalyani Publishers, New Delhi*
- Pandey, 2010. *A text book of Botany. S. Chand and Company Ltd., New Delhi*
- Santra and Chatterjee, 2007. *College Botany, New Central Book Agency (P) Ltd., Kolkata*
- Dutta, 1983. *A Class book of Botany, Oxford University Press, Calcutta*

S.Y.B.Sc. Semester II: (Voc-SETE-221) Paper-1: Vegetable Seed Production

Objectives:

1. To make the students familiar with vegetable seed production technology.
2. To know about the cultural practices and seed extraction and storage methods.
3. To be aware of and learn the various hybridization techniques.

Chapter-1: Concept, history and objectives	2L
Chapter-2: Classification of vegetable crops	2L
1) Classification based on growing season.	
2) Classification based on plant part used for consumption.	
Chapter-3: Reproduction in Vegetable crops	4L
1) Definition and types of reproduction	
2) Asexual reproduction (Vegetative and Apomixis)	
3) Sexual reproduction.	
a) Microsporogenesis	
b) Megasporogenesis	
c) Fertilization	
Chapter-4: Pollination Mechanism in Vegetable crops	8L
1) Definition	
2) Modes of pollination	
3) Pollen viability	
4) Stigma receptivity	
5) Mechanism of pollination control	
a) Self incompatibility (Types and control mechanism)	
b) Male sterility (GMS, CMS, CGMS)	
Chapter-5: Hybridization techniques in Vegetable crops	8L
1) Introduction.	
2) Objectives and types.	
3) Procedure.	
Chapter-6: Breeding Methods in Vegetable crops	6L
1) Introduction.	
2) Selection.	
a) Pure line selection	
b) Pedigree selection	
c) Bulk method.	
Chapter-7: Population Improvement	5L
1) Introduction	
2) Objectives and methods	
3) Mass Selection.	
4) Progeny Selection.	
5) Application and achievements.	
Chapter-8: Routine of seed production	13L

Seed production procedure in the following plants with reference to land requirement, Isolation, Nursery management, cultural practices, rouging, plant protection, harvesting, seed extraction method, seed drying and storage e.g. Brinjal, Tomato, Okra, Bitter guard and Onion.

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Umaraniet. *al.* 2006. Experimental Seed Science and Technology, *Agrobios, Jodhpur*
- Singh, 2009. Plant Breeding: Principles and Methods. *Kalyani Publishers, New Delhi*
- Agrawal, 2005. Seed Technology. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Reddy, 2008. Principles of crop production. *Kalyani Publishers, New Delhi*
- Pandey, 2010. A text book of Botany. *S. Chand and Company Ltd., New Delhi*
- Santra and Chatterjee, 2007. College Botany, *New Central Book Agency (P) Ltd., Kolkata*
- Dutta, 1983. A Class book of Botany, *Oxford University Press, Calcutta*

S.Y.B.Sc. Semester II: (Voc-SETE-222) Paper-2: Seed Quality Control

Objectives:

1. To learn about the concepts and significance of seed quality control.
2. To know about various aspects related to seed certification and seed legislation.
3. To have the knowledge of national and international seed quality control organizations and seed certification agencies.

Chapter-1: Introduction	2L
1) Concept of seed quality control	
Chapter-2: Seed certification	5L
1) Objectives	
2) Concepts	
3) Classes of seed	
4) Phases of Seed Certification	
5) Procedure of seed certification	
Chapter-3: Seed certification agencies and its organization	4L
Chapter-4: Minimum seed certification standards	8L
1) General seed certification standards.	
2) Specific crop standards.	
Chapter-5: Field inspection	10L
1) Objectives and general principles.	
2) Method of inspection.	
Chapter-6: Seed legislation	5L
1) Introduction	
2) Types of seed legislation	
3) Seed legislation in India (seeds act)	
Chapter-7: Seed law enforcement	4L
1) Introduction	
2) Duties of seed inspector	
3) Powers of seed inspector	
4) Offenses and penalties	
5) Procedure of seed law enforcement	
Chapter-8: Indian regulatory system in seed quality control	6L
1) International organizations and seed certification	
2) Statutory bodies and agencies established in India	
a. Central seed committee	
b. Central seed certification board	
c. Central seed testing laboratory	
d. State seed certification agency	
e. State seed testing laboratory	
f. Appellate authority	
g. Committee for recognition of seed certification agencies of foreign countries.	
Chapter-9: Organic Farming	4L

- 1) Introduction, concept,
- 2) Organic manures, vermin-composting, green manuring,
- 3) Biofertilizers;
- 4) Biopesticides and pheromones,
- 5) Trap crops, bird perches

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Umaraniet. *al.* 2006. Experimental Seed Science and Technology, *Agrobios, Jodhpur*
- Singh, 2009. Plant Breeding: Principles and Methods. *Kalyani Publishers, New Delhi*
- Agrawal, 2005. Seed Technology. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Reddy, 2008. Principles of crop production. *Kalyani Publishers, New Delhi*
- Pandey, 2010. A text book of Botany. *S. Chand and Company Ltd., New Delhi*
- Santra and Chatterjee, 2007. College Botany, *New Central Book Agency (P) Ltd., Kolkata*
- Dutta, 1983. A Class book of Botany, *Oxford University Press, Calcutta*

Practical Paper VOC-SETE-203 based on Theory Papers

Based on theory paper-VOC-SETE-211 and 212

1. Studies on floral morphology of some important field crop plants 2p
2. Emasculation and pollination studies in Maize and Cotton. 1p
3. Study on protogynous and protandrous nature of Pearl millet and sunflower. 1p
4. Identification of genetic male sterile plants at bud initiation stage and Laboratory method for confirmation of sterility in maize by aceto-carmin test under microscope. 1p
5. Seed Sampling and Dividing Equipments. 1p
6. Germination Testing (Paper, Sand and Soil Method). 1p
7. To study Seed vigour testing by physical method. 1p
8. ODV test and Physical purity analysis. 1p
9. Determination of weight 1p
10. Moisture testing by oven method and moisture meter. 1p
11. Compulsory visit to Seed Testing Laboratory 1p

Based on theory paper-VOC-SETE-221 and 222

1. Studies on floral morphology of some important vegetable crop plants. 2p
2. Emasculation and pollination studies vegetable crops. 1p
3. Study of anther arrangement and time of anthesis 1p
4. Seed extraction method in Tomato and Brinjal. 1p
5. Nursery requirements and Management for different vegetable crops 1p
6. Study of *In vitro* and *in vivo* germination of pollen (water, sugar and other media) and determination of percent pollen viability. 1p
7. Study of Minimum seed certification standards 1p
8. Taking of field counts and filling of inspection reports of important field crops 1p
9. Study of important biofertilisers and their production 2p
10. Visit to the vegetable breeding farm and seed quality control laboratory. 1p

References:

- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
- Umaraniet. *al.* 2006. Experimental Seed Science and Technology, *Agrobios, Jodhpur*
- Singh, 2009. Plant Breeding: Principles and Methods. *Kalyani Publishers, New Delhi*
- Agrawal, 2005. Seed Technology. *Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi*
- Reddy, 2008. Principles of crop production. *Kalyani Publishers, New Delhi*
- Pandey, 2010. A text book of Botany. *S. Chand and Company Ltd., New Delhi*
- Santra and Chatterjee, 2007. College Botany, *New Central Book Agency (P) Ltd., Kolkata*
- Dutta, 1983. A Class book of Botany, *Oxford University Press, Calcutta*

Annexure-II

Structure/ Pattern of Syllabus must be as follows:

- 1) Title of the Course: Seed Technology (Vocational)
- 2) Introduction: Pattern Semester
- 3) Eligibility: Should have offered Seed Technology (Vocational) at F.Y.B.Sc. and Passed F.Y.B. Sc. As per Pune University Rules
- 4) Examination
 - A) Pattern of examination
 - i) 40:10 (University semester examination of 40 Marks & Internal assessment of 10 Marks) Details as per the syllabus
 - ii) Pattern of the question paper: As per the specimen given
 - B) Standard of Passing: As per Pune University norms
 - C) ATKT Rules: As per Pune University norms
 - D) Award of Class: As per Pune University norms
 - E) External Students: As per Pune University norms
 - F) Setting of Question paper/ Pattern of Question paper: As per Pune University norms
 - G) Verification of Revaluation: As per Pune University norms
- 5) Structure of the Course:
 - i) Optional
 - ii) Medium of instruction: English
- 6) Equivalence subject/ papers & Transitory Provision: Seed Technology (Vocational)
- 7) University terms: As per Pune University Norms
- 8) Subject wise Detail Syllabus: Attached
- 9) Recommended books: Mentioned in syllabus
