Revised Syllabus (2013)

For

Vocational Course

In

SEED TECHNOLOGY

At

FYBSc level

Submitted to

University of Pune, Pune-7

By

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2013

University of Pune

INFORMATION ABOUT THE VOCATIONAL COURSE

B.Sc. Seed Technology (Vocational)

First year	1st Term	2nd Term
Paper – I (ST-1.1)	Morphology	Plant Breeding and Testing for Cultivar Genuineness
Paper – II (ST-1.2)	Seed Physiology	Seed Production
Paper-III (Practical) (ST-1.3)	Based on papers I & II.	
Second year	**Semester 1st**	
Paper – I (ST-2.1)	Hybrid Seed Production	
Paper – II (ST-2.2)	Seed Testing	
	Semester 2nd	
Paper – III (ST-2.3)	Vegetable Seed Production	
Paper – IV (ST-2.4)	Seed Quality Control	
Paper-VI (Practical) (ST-2.5)	Based on papers I, II, III & IV	
Third year	**Semester 1st**	
Paper – I (ST-3.1)	Seed Pathology and Entomology	
Paper – II (ST-3.2)	Seed Farm Management, Processing and Storage	
	Semester 2nd	
Paper – III (ST-3.3)	Entrepreneurship Development or Equivalent	
Paper – IV (ST-3.4)	Biotechnology and Intellectual Property Rights	
Paper-VI (Practical) (ST-3.5)	Based on papers I, II, III & IV	

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Work load Distribution

Term-I	: 36 lectures
Term-II	: 36 lectures
Total	: 72 lectures (Three lectures per week for Paper-I and Paper-II each)

Annual Exam Pattern

Theory

Internal Exam	: 20 Marks
Theory Exam	: 80 marks
Total	: 100 Marks examination
Duration	: 3 hours for theory and 40 minutes for internal exam

Practical

Internal Exam	: 20 Marks
Practical Exam	: 80 marks
Total	: 100 Marks examination
Duration	: 4 hours

Question Pattern for Internal Exam

Que.1) Choose the correct answer	1 x 5= 5 M
Que.2) State true or false	1 x 5= 5 M
Que.3) Define the following	1 x 5= 5 M
Que.4) Answer in two lines each	1 x 5= 5 M

Question Pattern for Theory Exam

Que.1) Answer in two lines (any eight)	2 x 8=16 M
Que.2) Answer any four of the following	4 x 4=16 M
Que.3) Write notes on any four of the following	4 x 4=16 M
Que.4) Answer any two of the following	8 x 2=16 M
Que.5) Answer any one of the following	1 x 16=16 M

Question Pattern for Practical Exam

• Oral, Journal, Submission, Visit Report	20 M
• As per the skeleton question paper	80 M

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Paper-I: Morphology, Plant Breeding and Testing for Cultivar Genuineness

Term I: Morphology

Chapter-1: Flower 4L

- Definition
- Detail study of flowers of the following crops:
  i. Wheat
  ii. Sorghum
  iii. Groundnut
  iv. Okra

Chapter-2: Study of Families 6L

- Dicotyledonous
  i. Malvaceae (*Gossypium arboreum*)
  ii. Fabaceae (*Glycine max / Cajanus cajan*)
  iii. Solanaceae (*Solanum melongena / Lycopersicum esculentum*)
  iv. Asteraceae (*Helianthus annuus*)
- Monocotyledonous
  i. Liliaceae (*Allium cepa*)
  ii. Poaceae (*Zea mays / Pennisetum typhoides*)

Chapter-3: Microsporangium 2L

- Definition
- Structure (T.S of typical anther)
- Development of microspore
- Development of male gametophyte

Chapter-4: Megasporangium 2L

- Definition
- Structure (L.S of Ovule) and types of ovules
- Development of megaspore
- Development of female gametophyte

Chapter-5: Reproduction 4L

- Definition
- Vegetative (Natural and Artificial) propagation
- Sexual reproduction

Chapter-6: Pollination 4L

- Definition
- Types of pollination (Autogamy and Allogamy)
- Contrivances in self and cross pollination
- Agencies of allogamy
- Advantages and Disadvantages of both self and cross pollination

Chapter-7: Fertilization 4L

- Definition
- Process of Fertilization in angiosperms

Chapter-8: Endosperm and Embryo Development 4L

- Definition
- Types of endosperm
- Functions of endosperm
- Development of dicot embryo
- Development of monocot embryo

Chapter-9: Seed 3L

- Definition
- Difference between seed and grain
- Concept of seed quality
  i. Inner core
  ii. Middle core
  iii. Outer core

Chapter-10: Fruit 3L

- Definition
- Classification of fruits
- Detail study of following fruits
  i. Cypsella-Sunflower
  ii. Caryopsis-Maize
  iii. Legume-Tur
  iv. Capsule-Okra
  v. Berry-Tomato
  vi. Pepo-Cucumber
  vii. Cremocarp-Coriander

Term-II: Plant Breeding and Testing for Cultivar Genuineness

Chapter-11: General Introduction to Plant Breeding 3L

- Definition
- Scope
- Objectives

Chapter-12: Activities in Plant Breeding 3L

- Creation of variation
- Selection
- Evaluation
- Multiplication
- Distribution

Chapter-13: Plant Introduction — 3L

- Definition
- Types (Primary and Secondary)
- Procedure
- Merits and Demerits
- Important achievements

Chapter-14: Pure Line Selection — 3L

- Definition
- Characters of pure line
- General scheme for pure line selection
- Advantages and Disadvantages of pure line selection
- Achievements

Chapter-15: Mass Selection — 4L

- Definition
- Procedure for mass selection
- Advantages and Disadvantages of mass selection
- Achievements

Chapter-16: Clonal Selection — 4L

- Definition
- Characters of clone
- Procedure for clonal selection
- Advantages and Disadvantages of clonal selection
- Achievements

Chapter-17: Hybridization — 5L

- Definition
- Objectives
- Types: Intervarietal and Distant hybridization
- Procedure
- Difficulties in hybridization
- Consequences

Chapter-18: Mutation for crop improvement — 3L

- Definition
- Mutagens (Physical and Chemical), Mutants
- Types of mutation (Point, Chromosomal, Spontaneous and Induced)
- Application of mutation breeding
- Limitations of mutation breeding
- Achievements

Chapter-19: Advanced Techniques in Plant Breeding — 2L

- Advanced Techniques
- Definition of Tissue, Embryo and Anther Culture
- Applications of Tissue, Embryo and Anther Culture
- Somaclonal variations

Chapter-20: Testing for Cultivar Genuineness **6L**

- Examination of Seeds
  i. Morphological characters
  ii. Chemical tests (Phenol colour and Peroxidase tests)
  iii. Biochemical test (Electrophoresis)
- Examination of Seedling
- Grow Out Test

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*
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Paper-II: Seed Physiology and Seed Production

Term I: Seed Physiology

Chapter- 1: Structure and Composition 5L

- Introduction
- Seed structure (Embryo, Endosperm, Seed coat)
- Composition of seed storage constituents (Carbohydrates, Protein, Oil and fats)

Chapter-2: Physiology of Seed development 3L

Chapter-3: Seed Germination 7L

- Introduction
- Definition
- Types of Germination
  i.Hypogeal germination
  ii. Epigeal germination
- Physiological and Biochemical changes during germination.
- Seedling abnormalities and its causes

Chapter-4: Seed Dormancy 6L

- Introduction and Definition
- Types of Dormancy
- Factors affecting dormancy
- Methods of breaking dormancy

Chapter-5: Seed storage and longevity 6L

- Introduction and Definition
- Physiology of seed storage
- Seed deterioration
- Short term and long term storage
- Storage condition
- Factors affecting seed longevity

Chapter-6: Seed Vigour and seed viability 6L

- Introduction
- Importance of seed vigour
- Factors affecting seed vigour
- Seed ageing and deterioration
- Seed viability concept

Chapter-7: Seed pelleting and Artificial seed 3L

- Process of pelleting
- Material
- Types of coating
- Advantages and precaution
- Production of Artificial seed (Synthetic seed)

Term II: Seed Production

Chapter-8: General Introduction — 2L

- Seed as basic input in Agriculture
- Classes of seed
  i. Nucleus
  ii. Breeders
  iii. Foundation
  iv. Certified

Chapter-9: Seed Production Organization in India — 2L

- Introduction
- National Seed Corporation (NSC) and its objectives
- State Seed Corporation (SSC) and its objectives

Chapter-10: Release of New Variety — 6L

- Introduction
- Evaluation
  i. Station trial
  ii. Multi-location trial
  iii. Disease and insect tests
  iv. Quality tests
- Identification of entries for release
- Release of a variety
- Multiplication

Chapter-11: Seed Production Methodology — 6L

- Location and Season
- Land requirement
- Cultural practices
- Isolation
- Plant protection
- Weed control
- Roguing
- Special operation
- Harvesting
- Threshing
- Processing

Chapter-12: Sowing — 4L

- Definition
- Time of sowing
- Calculation for seed rate
- Methods of sowing

Chapter-13: Land Preparation — 4L

- Definition.
- Steps in land preparation for different crops (Cotton, Bajra, Wheat, Chilli and Cauliflower)
- Types of nursery beds

Chapter-14: Irrigation and Drainage 5L

- Definition
- Methods of irrigation
- Sources of irrigation
- Controlling water loss
- Quality of irrigation water
- Losses due to excessive irrigation
- Importance of drainage

Chapter-15: Genetic Purity and its maintenance 4L

- Definition
- Steps for maintenance of genetic purity
  i. Checking seed source
  ii. Isolation distance
  iii. Roguing
  iv. Precaution during crossing program
  v. Care during harvesting and threshing

Chapter-16: Introduction to Crop Diseases 3L

- Definition
- Types-Biotic and Abiotic
- Tikka (Ground nut)
- Smut (Jowar)
- Rust (Wheat)
- Early blight (Tomato)

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Paper-III: Practical based on Paper-I and Paper-II

Term-I

1. Study of seed production practices in relation to sowing, roughing, irrigation in cotton/bajra/sorghum/tomato/brinjal — 2P
2. Study of Families — 2P
   - Dicotyledonous
     i. Malvaceae (*Gossypium arboreum*)
     ii. Fabaceae (*Glycine max / Cajanus cajan*)
     iii. Solanaceae (*Solanum melongena / Lycopersicum esculentum*)
     iv. Asteraceae (*Helianthus annus*)
   - Monocotyledonous
     i. Liliaceae (*Allium cepa*)
     ii. Poaceae (*Zea mays*)
3. Study of vegetative propagation methods — 1P
   - Tubers
   - Runners
   - Bulbs
   - Corms
   - Suckers
4. Study of artificial vegetative propagation methods — 1P
   - Stem cutting
   - T-budding
   - Air layering
   - Stone grafting
5. Study of Crop Fruits — 1P
   - Cypsella-Sunflower
   - Caryopsis-Maize
   - Legume-Tur
   - Capsule-Okra
   - Berry-Tomato
   - Pepo-Cucumber
   - Cremocarp-Coriander
6. Study of dicot and monocot seeds with suitable examples (Morphology) — 1P
7. To study different types of seed germination (hypogeal and epigeal) — 1P
8. To identify type of dormancy and study different methods of breaking dormancy — 1P
9. To study quick viability test (TZ test) and Seed vigour testing by physical method — 1P

Term-II

10. Preparation of nursery beds 2P
11. Grow Out Test 1P
12. Study of seed production practices in relation to weed control, harvesting and threshing in cotton/bajra/sorghum/tomato/brinjal 2P

13. Study of hybridization technique in cotton 1P
14. Identification of morphological and chlorophyll mutants in chick pea (demonstration) 1P
15. Study of varietal descriptors 1P
16. Varietal identification in wheat by using Phenol Colour Test 1P
17. Admixture testing in soybean seed by using Peroxidase test 1P
18. Demonstration of Electrophoresis 1P
19. Seed Industry/Plant Breeding Research Centre visit is compulsory for the students. They are supposed to write a visit/study report and submit it at the time of final practical examination. 1P
20. Students are supposed to submit seed samples (minimum 10) along with their botanical names, family, variety etc. to the department at the time of final practical examination. 1P

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- Handbook of Agriculture- *Indian Council of Agricultural Research, New Delhi*
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