

## T.Y.B.Sc.

## ANNEXURE – II

- 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 & S.Y.B.Sc and passed as per University rules
- 4) Examination
  - A) Pattern of examination
    - i) 40-10 University semester examination of 40 marks & Internal assessment of 10marks. ii) Pattern of the question paper- As per specimen given
  - B) Standard of Passing: As per University norms
  - C) ATKT Rules: As per University norms
  - D) Award of Class: As per University norms
  - E) External Students : Not allowed
  - F) Setting of Question paper/ Pattern of Question paper: As per University norms
  - G) Verification of Revaluation: As per 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 University norms
- 8) Subject wise Detail Syllabus: Attached
- 9) Recommended books: Mentioned in the syllabus

<b>Third year</b>	<b>Semester III</b>
Paper –I (VOC-ST-311)	Seed Pathology and Entomology
Paper – II (VOC-ST-312)	Seed Farm Management, Processing and Storage
	<b>Semester IV</b>
Paper –III (VOC-ST-321)	Entrepreneurship Development
Paper – IV (VOC-ST-322)	Biotechnology and Intellectual Property Rights
Paper-VI (Practical)	Based on papers I, II, III & IV

### Work load Distribution

<b>Semester-I</b>	: 48 lectures (Theory) + 48 lectures (Theory) + 48 lectures (Practical)
<b>Semester-II</b>	: 48 lectures (Theory) + 48 lectures (Theory) + 48 lectures (Practical)
<b>Total</b>	: 96 lectures (Theory) + 96 lectures (Theory) + 96 lectures (Practical) (Four lectures per week for Paper-I and Paper-II each)

### Annual Exam Pattern

#### Theory

<b>Internal Exam</b>	: 10 Marks
<b>External Exam</b>	: 40 marks
<b>Total</b>	: 50 Marks examination
<b>Duration</b>	: 2 hours for external and 40 minutes for internal exam

#### Practical

<b>Internal Exam</b>	: 20 Marks
<b>External Exam</b>	: 80 marks
<b>Total</b>	: 100 Marks examination
<b>Duration</b>	:4 hours

### Question Pattern for Theory 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 External Exam

Que.1) Answer in one lines (any ten)	1 x 10=10 M
Que.2) Answer any two of the following	5 x 2=10 M
Que.3) Write notes on any two of the following	5 x 2=10 M
Que.4) Answer any one of the following	10 x 1=10 M

### **Question Pattern for Practical Exam**

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

# University of Pune

## INFORMATION ABOUT THE VOCATIONAL COURSE B.Sc. Seed Technology (Vocational)

---

<b>First year</b>	<b>1<sup>st</sup> Term</b>	<b>2<sup>nd</sup> Term</b>
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.	
<b>Second year</b>		
<b>Semester I</b>		
Paper –I (VOC-ST-211)	Hybrid Seed Production	
Paper – II (VOC-ST-212)	Seed Testing	
<b>Semester II</b>		
Paper –III (VOC-ST-221)	Vegetable Seed Production	
Paper – IV (VOC-ST-222)	Seed Quality Control	
Paper-VI (Practical)	Based on papers I, II, III & IV	
<b>Third year</b>		
<b>Semester III</b>		
Paper –I (VOC-ST-311)	Seed Pathology and Entomology	
Paper – II (VOC-ST-312)	Seed Farm Management, Processing and Storage	
<b>Semester IV</b>		
Paper –III (VOC-ST-321)		
Paper – IV (VOC-ST-322)	Biotechnology and Intellectual Property Rights	
Paper-VI (Practical)	Based on papers I, II, III & IV	

**T.Y.B.Sc- Vocational Seed Technology**  
**Semester III Paper-V**  
**Paper –I (VOC-ST-311) SEED PATHOLOGY AND ENTOMOLOGY**  
**48L**

---

<b>Chapter-1: Introduction and History of Seed Pathology</b>	<b>03</b>
1) Definition	
2) History of seed pathology	
3) Influence of seed borne diseases	
<b>Chapter-2: Seed Borne and Storage Fungi</b>	<b>08</b>
1) Definition of seed borne and storage fungi	
2) Differences between seed borne and storage fungi	
3) Mechanism of seed transmission and entry point of seed infection	
4) Common seed borne fungi (Any two) with examples	
5) Common storage fungi (Any two) with examples	
<b>Chapter-3: Seed Borne Bacteria and Viruses</b>	<b>06</b>
1) Definition	
2) Impact of seed borne bacteria and viruses on seeds or crop with suitable examples (any two)	
<b>Chapter-4: Introduction of Seed Entomology</b>	<b>03</b>
1) Definition	
2) History of insect pest	
3) Relation of insects and plants	
4) Insects as vector of plant diseases	
<b>Chapter-5 Orders of insect pest</b>	<b>06</b>
1) Lepidoptera	
2) Diptera	
3) Hemiptera	
4) Isoptera	
5) Coleoptera	

**Chapter-6: Study of any four Insect Pest of Fibre crop/Pulses/Cereals/Vegetables** with respect to their life cycle, way of infestation/damage, symptoms and control measures. **08**

**Chapter-7: Storage entomology** **06**

- 1) Definition
- 2) Introduction to storage entomology
- 3) Pest problem in seed storage
- 4) Study of any two storage grain pest with respect to their life cycle, way of infestation/damage, symptoms and control measures.

**Chapter-8: Seed Storage Management** **08**

- 1) Introduction
- 2) Methods of Seed health testing
- 3) Seed treatment
- 4) Management of seed storage structures

**References:**

- Anonmyous, Hand Book of Agriculture, ICAR, New Delhi
- Krishnasamy et al., 2004. Compendium on Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore
- Srivastava K. P., 2009., A Text Book of Applied Entomology, Kalyani Publishers, Ludhiana
- Dahiya B. S. and Rai K. N. 1997. Seed Technology, Kalyani Publishers, Ludhiana
- Aneja K. R. 2009. Experiments in microbiology, plant pathology and biotechnology, New Age International (P) Limited Publishers.
- Anonmyous. 1997. Seed Technology in Tropics. ISTA Zurich.
- Agrawal, R.L. 1996. Seed Technology, IBH publishing Co., New Delhi.
- Thompson, J.R. 1977. Advances in Research and Technology of Seeds. Part - 1, 3 & 4. Centre for Agrl. Publishing and Documentation, Washington.
- Desai. B.B., P.M Kotecha and D.K. Salunkha. 1997. Seeds Hand Book - Biology Production, Processing and Storage. Marcel Dekker. New York.
- Kozlowski, T.T. 1972. Seed Biology, Vol. 1 Academic Press, London.
- Justice, O.L. and L.N. Basu. 1978. Principles and Practices of Seed Storage. Castle House Publications Ltd, Great Britain.
- Copeland, L.O and McDonald. 1995 . Principles of Seed Science and Technology, Chapman and Hall, New York, USA.
- ISTA . 1999 . Seed Science and Technology , Vol. 27 , Supplement , Rules , International Seed Testing Association , Zurich , Switzerland .
- Khare , D and M. S. Bhale 2000 . Seed Technology Scientific Publishers (INDIA) , Jodhpur .

- McDonald , M.B. and L.O. Copland . 1999. Seed Science and Technology Laboratory Manual. Scientific Publishers, Jodhpur ,
- K.Vanangamudi , N. Natarajan , A, Bhatathi , R. Umarani and T. Saravanan . Advances in Seed Science and Technology , Vol I .
- Sam Kugbei . Seed economics. International Center For Agricultural in the dry areas . Scientific publishers (INDIA ) Jodhpur.

**T.Y.B.Sc- Vocational Seed Technology**  
**Semester III Paper-VI**  
**Paper – II (VOC-ST-312) SEED FARM MANAGEMENT, PROCESSING AND STORAGE**  
**48L**

---

<b>Chapter-1: Introduction</b>	<b>03</b>
1) Scope and objectives	
<b>Chapter-2: Farm Management</b>	<b>06</b>
1) Introduction and Definition	
2) Objectives and scope of Farm management	
3) Farm management vs Agricultural economics	
4) Graphic presentation of the Place of Farm management	
5) Use of farm management as personal matter	
6) Use of farm management in actual farming	
<b>Chapter-3: Farm Business</b>	<b>06</b>
1) Introduction	
2) Factors involved in the selection of a business (Locality limitations, Capital limitations, Income limitations and personal inclination)	
3) Comparison of general and specialized farming	
4) General farming for beginners	
<b>Chapter-4: Management of Seed Processing</b>	<b>04</b>
1) Layout of seed processing plant	
2) Basic flow pattern in seed processing plant	
3) Types of layouts	
4) Maintenance and management of the plant	
<b>Chapter-5: Seed Processing</b>	<b>12</b>
1) Various steps in seed processing	
2) Receiving the seed in seed processing unit	
3) Conditioning	
4) Seed drying	
5) Seed cleaning	
6) Separation and grading	
<b>Chapter-6: Seed Treatment</b>	<b>05</b>
1) Need of seed treatment	
2) Kinds and methods of seed treatment	



a. Mechanical b. Physical c. Chemical

3) Seed treating equipments

**Chapter-7: Seed Storage**

**08**

1) Bagging and its methods

2) Methods of seed storage

3) Storage containers

4) Factors affecting storability of seeds

5) Changes during seed storage

6) Basic requirements of seed storage

**Chapter-8: Seed Marketing**

**04**

1) Introduction

2) Major components of seed marketing

3) Role of different seed organizations in seed marketing

**References:**

- Ponnuswamy , A.S. 2001 , Quality Seed Production in Hybrids Rice In Recent Techniques and Participatory Approaches on Quality Seed Production ICAR Winter School Training Manual , Dept . of Seed Science and Technology , Tamil Nadu Agricultural University , Coimbatore 641 003, India .
- R. Umarani , R.Jerlin , N. Natrajan , P.Masilamani and A.S. Ponnuswamy , Experimental Seed Science and Technology Dept . of Seed Science and Technology , Tamil Nadu Agricultural University , Coimbatore 641 003, India .
- L.E. Everson . Hand Book Of Pure Seed Definitions .The International Seed Testing Association Zurich , Switzerland .
- L.M. Jeswani , B. BAlddev . Pulse Production Technology . Publication and Information Division , Indian Council of Agricultural Research Krishi Anusandhan Bhavan , Pusa New Delhi .
- Justice, O.L. and L.N. Basu. 1978. Principles and Practices of Seed Storage. Castle House Publications Ltd, Great Britain.
- Desai. B.B., P.M Kotecha and D.K. Salunkha. 1997. Seeds Hand Book - Biology Production, Processing and Storage. Marcel Dekker. New York.

**T.Y.B.Sc Vocational Seed Technology**  
**Semester IV Paper V:**  
**Paper –III (VOC-ST-321) Entrepreneurship Development**

Entrepreneurship is a tremendous force that can have a big impact in growth, recovery, and societal progress by fuelling innovation, employment generation and social empowerment.

Through entrepreneurship education, young people, including those with disabilities, learn organizational skills, including time management, leadership development and interpersonal skills, all of which are highly transferable skills sought by employers.

**The syllabus for T.Y.B.Sc., Vocational students** thus is aimed at creating an awareness amongst the students about the benefits of becoming an entrepreneur and at the same time equip them with information about a good and a viable opportunity; making a business plan by assessing the techno-economic feasibility, seeking financial assistance, variety of procedures and formalities for setting up an Small Scale enterprise, taking decisions in such a manner so that entrepreneurship becomes a life time career goal.

**OBJECTIVES:**

- To create awareness about self-employment and motivate the students to go for self-employment.
- To study entrepreneurship concepts and their applicability.
- To familiarize the students to the practical world of enterprise/business.

**1. INTRODUCTION:**

Concept of entrepreneurship, Historical background, need and scope of entrepreneurship in modern society, Entrepreneurial behavior, attributes and skills.

Key elements of entrepreneur, Entrepreneurial process, Entrepreneurial culture,

Environment of Entrepreneurship, Socio economic origins of Entrepreneurship,

Barriers of Entrepreneurship and means to reduce those, types of Entrepreneurs, Characteristics of Entrepreneur.

8 Lectures

**2. BUSINESS ORGANIZATIONS:**

Forms of business organizations such as sole proprietorship, partnership, Joint Stock Company, cooperative organization etc.

Meaning and definition , Relative merits and demerits of each form, ,

Types of Small Scale Industry.

3 Lectures

**3. Study of organizations promoting Entrepreneurship**

Sources of Information: Where to go for what?

- a) District Industry Centre (DIC)
  - b) Maharashtra Industrial Development Corporation (MIDC)
  - c) Maharashtra State Small Industries Development Corporation (MSSI DC)
  - d) Small Industries Services Institute (SISI)
  - e) National Institutes of Entrepreneurship and Small business Development (NIESBUD)
  - f) National Entrepreneurship Development Board (12) (NEDB)
  - g) Entrepreneurship Development Institute of India
  - h) Commercial and Co-operative Banks
  - i) State Industrial Development Bank (SIDBI)
  - j) Pollution Control Board
- 3 Lectures

### **Legal Aspects of Small Business:**

Elementary knowledge of Income Tax, Sales Tax, VAT, Service Tax, Patent Rules, Excise Rules, Factory Act and Payment of Wages Act, TDS act Procedures for registration of SSI, TDS no, PAN no.

2 Lectures

### **3. ENTREPRENEURSHIP DEVELOPMENT:**

Identification of opportunities for entrepreneurship, ideas to start new business, criteria for selection of new product or service, Market Survey as a tool, Technical and economic feasibility of a project, Role of consultancy organizations.

8 Lectures

Project formulation and project report preparation (Use guidelines given in Schedule II)

4 Lectures

### **4. FINANCIAL ASPECTS:**

#### **Govt/Public sources of finance**

Sources of finance, Role of various funding agencies, government and commercial Role of various funding corporations and funding institutes such as chamber of commerce, MSFC, MCED, NSSIDC, Banks, special institutes such as IDBI, MIDC, SICOM etc, Working capital, cash flow, fund flow, study of basic financial statements, costing and pricing, breakeven point, SWOT analysis.

#### **Private Sources**

1. Equity –Angel finance , Venture capital
2. Debt Finance – Loans from banks loan against co-lateral security, PMYR-Loans with subsidy from Central GOVT, State Govt , CGTSME(Central Grant For Small Medium Enterprise)

8 Lectures

### **5. MARKETING ASPECTS:**

Meaning, scope and importance, Marketing strategy, Market segmentation, marketing channels. Marketing mix and its effect.

Digital marketing through Web browsing, Face book , Google search engines SMS campaigns , Mailers , Hand bills etc

6 Lectures

### **6. HUMAN RESOURCE ASPECTS: (H.R Policies)**

Concept and scope in modern industry,

Different modes of employment, Placement of proper person for a job, Interpersonal relations and communication skills, training of personnel, guidance for stress management, soft skills.

Drafting -Appointment letter, termination tenure , experience certificates , exit policies

Legal liabilities of employees, Group insurance for factory workers, understanding WAC (Workers Accident Compensation )

6 Lectures

### Practicals/ Assignments

The practicals to be conducted are with an objective to transform the knowledge gained by the students in their classes to real life experience. These practicals will be based on the vocational subject and the Principal subject a student has offered

Internal assessment should carried out on the practicals/ assignments done by a student

Sr. No.	Title of Practical	Objective	Mode
1.	Role of District industry centre	Understand the working of District industry centre	Visit and report submission
2.	Visit to a small scale Industry	To understand plant location and plant layout and to submit a report on the guidelines given in <b>schedule I</b>	Visit and report submission
3.	Visit to a service unit	To study the legal aspects of a service unit and to submit a report	Visit and report submission
4.	Entrepreneurial ideas	Describe in brief two entrepreneurial ideas of yours	Home assignment
5.	Project formulation	Prepare a preliminary document about an enterprise you want to start It should contain executive summary, customer/target market analysis and strategy (use guidelines given in <b>schedule II</b> )	Home assignment
6.	Review business plans For this Plans should be exchanged with other teams	Submit a <b>review</b> of a business plan of <b>other team</b> . It should include critical and constructive comments	Home assignment
7.	Drafting a business	It should contain executive summary,	Power Point

	plan	customer/target market analysis and strategy, marketing and operations, risks, management team and financial projections	Presentation
--	------	--	--------------

### **RECOMMENDED BOOKS**

#### **Text book**

1. Dynamics of Entrepreneurial Development and Management – Shri. Vasant Desai.(Latest edition)

#### **Reference books (Latest Editions)**

1. Environment & Entrepreneur: Mr.B.C.Tondon
2. Business Environment: Dr.G.V.Kayande Patil
3. Udyogvardhini –MCED
4. Basic Communication Skills: By P. Kiranmai Dutt & Geetha Rajeevan, 2000
5. Fundamentals of Office Management: By J.P. Mahajan , Office Management – By S. P. Arrora, latest edition
6. A guide to small Scale Entrepreneurs, Director of Industries, Govt. of Tamil Nadu Chennai, latest edition
7. Entrepreneurship and small Business Management- Dr. C. B. Gupta & Dr. Khanna
8. Project Management- K. Nagarajan
9. 100 project Reports Yashwantrao Chavan Open University (YCMOU) Edition
10. Entrepreneurship Ideas in Action Cynthia L. Greene (YCMOU) Edition

## Schedule-I

### Visit to a small scale Industry

1	Year of commencement of the project	
2	Work experience of the entrepreneur before starting the project	
3	Detailed information of the product	
4	Type of customers using their product	
5	Pricing details of all the product range	
6	No. of workers/ Staff working in the Unit	
7	Turnover in the last three years	
8	Mode of Advt/Marketing adapted for promoting the Products	
9	Investment done at the time of starting the project	

## Schedule II

### Project formulation

1	Product /services Selected its justification	
2	Capital investment required to start the Services /Product	
3	Minimum Infrastructure requirement	
4	Rent as per current rates for the same premises/ Office /Factory	
5	Various Competitors currently for the same product /Services	
6	Your unique selling proposition USP ie write down why your product will be preferred by the customer as against the present competition. 1) Features 2) Cost 3) Geographic location 4) service 5)durability	
7	Marketing Strategy used for Advertising your product	
8	Various digital marketing methods to be selected	
9	What will be your ROI(Return On Investment)	
10	What will be your Break even point	
11	How will you be raising the finance for the same	
12	Prepare a three years Balance sheet, / P/L statement taking help from a Third year commerce stream student.(optional)	

**T.Y.B. Sc- Vocational Seed Technology**  
**Semester IV Paper-VI**  
**Paper – IV (VOC-ST-322) BIOTECHNOLOGY AND INTELLECTUAL PROPERTY RIGHTS**  
**48L**

---

<b>Chapter-1: Introduction to Biotechnology</b>	<b>2L</b>
1) Definition, Branches, scope and applications	
<b>Chapter-2: Aids to variety identification</b>	<b>10L</b>
a. PCR	
b. SDS-PAGE	
c. RFLP	
d. RAPDs	
e. DNA finger printing	
f. ELISA	
<b>Chapter-3: Methods of gene cloning</b> –in vivo gene cloning - vectors used in gene cloning (Plasmid vectors, lamda ( $\lambda$ ) phage vectors, cosmids and expression vectors), selection of vectors. DNA polymorphism, Use of various enzymes in recombinant DNA technology	<b>6L</b>
<b>Chapter-4: Techniques in restriction mapping, Southern, Northern, Western, Blotting techniques and applications</b>	<b>5 L</b>
<b>Chapter-5: Technique of Micro propagation in development of crop plants</b>	<b>12L</b>
a. Tissue culture in Banana	
b. Anther culture	
c. Embryo culture	
d. Synthetic seeds	
<b>Chapter-6: Transgenics</b> e.g. Bt cotton and Golden Rice, technique and applications	<b>5L</b>
<b>Chapter-7: Intellectual Property Rights (IPR)</b>	<b>5L</b>
a. Introduction	
b. History	
c. Intellectual Property	
d. Protection of IPR (Trade secrets, Patents, and copyright.)	
e. Plant Breeder's Rights	



**Chapter-8: World trade organization**

**1L**

**Chapetr-9: Introduction to ICAR and IARI**

**2L**

**References:**

1. Chawla HC (2004) – Introduction to plant biotechnology (Science Publ)
2. Davies K (Ed) (2004) – Plant pigments and their manipulation – Annual plant revies, vol 14 (Blackwell Publ)
3. Altman A, Hasegawa PM (Ed) (2012) – Plant Biotechnology and agriculture. Prospects for the 21st century (Academic press).
4. Bhojwani SS. &Razdan MK (1996). - Plant Tissue Culture : Theory & Practice (Elsevier)
5. Hou CT, Shaw JF (2009) – Biocatalysis and agricultural biotechnology (CRC Press)
6. Slater A, Scott NW, Fowler MR (2008) – Plant Biotechnology: the genetic manipulation of plants (Oxford Press)
7. Rai M (2009) – Fungal Biotechnology (IK International)
8. Vasil IK, Thorpe TA (1994) – Plant cell and tissue culture (Springer)
9. H K Das Textbook of Biotechnology 4th edition

**T.Y.B.Sc- Vocational Seed Technology**  
**Paper-VI (Practical) Based on papers I, II, III & IV**

**Practicals based on theory paper- Seed Pathology and Entomology**

- 1) Demonstration and handling of stereo binocular and research microscope. **(1P)**
- 2) Symptoms and identification of important seed borne pathogens (Fungi). **(2P)**
- 3) Visual examination of dry seeds for disease symptoms. **(1P)**
- 4) Examination of suspensions obtained from washing of seeds. **(1P)**
- 5) Study of any two important storage grain pest with respect to their life cycle, way of infestation/damage, symptoms and control measures. **(2P)**
- 6) Detection of important seed borne fungi with the help of various detection methods (Agar and blotter paper method). **(3P)**
- 7) Detection of important seed borne bacteria with the help of various detection methods. **(2P)**

**Practicals based on theory paper- Seed Farm Management, Processing and Storage**

- 1) Study of seed treatment equipments and application of various chemicals. **(2P)**
- 2) Visit to a seed processing and storage complex. **(2P)**
- 3) Study of air screen cleaner cum grader. **(1P)**
- 4) Study of different types of elevator and conveyors. **(1P)**
- 5) Study of seed packaging equipments. **(1P)**
- 6) Study of specific gravity separator. **(1P)**
- 7) Soil sampling for fertility and moisture content. **(1P)**
- 8) Demonstration of some important farm machines. **(1P)**
- 9) One day visit with seed marketing executive. **(2P)**

**Practicals based on theory paper-- Biotechnology and Intellectual Property Rights**

1. Isolation of plant genomic DNA from Spinach Leaves. **(2P)**
2. Peroxidase isozyme profiling for varietal identification. **(1P)**
3. Restriction digestion of DNA. **(1P)**
4. Separation and detection of specific proteins using Western blotting **(2P)**
5. Demonstration of PCR facility and DNA fingerprints (Photographs) **(1P)**
6. Preparation of culture media. **(1P)**
7. Sterilization of media and glassware. **(1P)**
8. Inoculation and culture of explants. **(1P)**
9. Micropropagation of Banana. **(1P)**
10. Collection and filling of application forms for patent filing. **(1P)**

**Practical Paper Based on theory papers and Entrepreneurship Development**