

Devrukh Shikshan Prasarak Mandal's  
**Nya.Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce & Vid.  
Dadasaheb Pitre Science College Devrukh.**  
**[Autonomous College]**

**SYLLABUS**

<b>Sr. No.</b>	<b>Heading</b>	<b>Particulars</b>
<b>1</b>	<b>Title of Course</b>	<b>B.Voc. Sustainable Agriculture Second Year</b>
<b>2</b>	<b>Eligibility for Admission</b>	<b>10+2 (of recognized board)</b>
<b>3</b>	<b>Passing Marks</b>	<b>40%</b>
<b>4</b>	<b>Ordinances/Regulations (if any)</b>	<b>-</b>
<b>5</b>	<b>No. of Years/Semesters</b>	<b>Three years/ Six semester</b>
<b>6</b>	<b>Level</b>	<b>U.G.</b>
<b>7</b>	<b>Pattern</b>	<b>Semester</b>
<b>8</b>	<b>Status</b>	<b>New Syllabus</b>
<b>9</b>	<b>To be implemented from Academic year</b>	<b>2021-22</b>

Devrukh Shikshan Prasarak Mandal's  
**Nya.Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce  
& Vid. Dadasaheb Pitre Science College Devrukh**  
**[Autonomous College]**



**Syllabus for S.Y. B.Voc.**

**Program: B. Voc. Sustainable Agriculture**

**Course: S.Y. B.Voc. Sustainable Agriculture**

## (Credit Based Grading and Semester System with effect from the academic year 2020-2021)

### **B.Voc Programme**

The University Grants Commission (UGC) had launched a scheme for skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc) degree with multiple entry and exit points. The B.Voc program is focused on providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge. The duration of the B. Voc courses will be six semesters in three Academic Sessions. At the end of each Semester, the candidates shall be required to present themselves for examination. The student who completes first semester successfully and is opting out from further education in B.Voc program, will be conferred Certificate in respective subject/trade. The student who completes first year i.e. first two semesters successfully and is opting out from further education in B.Voc program, will be conferred Diploma in respective subject/trade. Similarly, the student who completes first two years i.e. four semesters successfully and is opting out from further education will be conferred Advanced Diploma. The degree of B.Voc shall be conferred on the candidate who pursues the prescribed course of study for six semesters. The B. Voc degree is equivalent to BA/B.Sc degree for higher studies and employment.

### **Objectives of the Course**

Many factors like, available infrastructure, capital and power, availability of resources, transport network, climate favoring to the high potential of industrial growth in Kokan region. The consistent growth of several Pharmaceutical, Chemical, Agrochemical, Food and Petrochemical industries has created several job avenues to the skilled graduates. The major hurdles for these industries are lack of adequately skilled and Good Laboratory Practice (GLP) oriented workforces.

This course is designed to fulfill the skilled workforce requirement of Research & Development and testing laboratories in various industries.

The course covers following objectives:-

- To propagate the ideas, practices and policies that constitutes the concept of sustainable agriculture.
- To provide the skill of different processes for Sustainable Agriculture
- To impart knowledge and proficiency in Organic farming, Certification process and marketing of organically raised agricultural produces
- To empower the students with an economically viable, socially supportive and ecologically sound education for agricultural sustainability.
- To provide education that emphasizes topography, soil characteristics, climate, pests, local availability of inputs and the individual grower's goals.
- Develop communication and soft skills between farmers and suppliers.
- Promote self-employment and income generation.
- Develop awareness about environment, soil and resources conservation for sustainable development.

### **Course Outcomes**

- To enable the students to acquire knowledge on importance of agriculture and various processes of farming.

- To study the fundamentals of agronomy and classification of field crops.
- To study fundamentals of horticulture, gardening
- To learn preparation of various organic manures and using it for sustainable agriculture
- To study various processes of integrated farming practices

## PROGRAMME STRUCTURE

The BVoc Programme shall include General Education components and Skill Components.

The credit distribution for the programme is shown below.

<b>Normal Calendar Duration</b>	<b>Skill Component Credits</b>	<b>General Education Credits</b>	<b>Total Credits</b>
One semester	18	12	<b>30</b>
Two Semesters	36	24	<b>60</b>
Four Semesters	72	48	<b>120</b>
Six Semesters	108	72	<b>180</b>

Year/Semester	NSQF Certification Level	Vocational Qualification	Title of Programme
<b>First Year (Sem. I)</b>	4	Certificate Course (Duration 6 Months)	Certificate course in Sustainable Agriculture
<b>First Year (Sem. II)</b>	5	Diploma (Duration 1 Year)	Diploma in Sustainable Agriculture
<b>Second Year (Sem. III and IV)</b>	6	Advanced Diploma (Duration two years)	Advanced Diploma in Sustainable Agriculture
<b>Third Year</b>	7	B. Voc. (Sustainable Agriculture)	B. Voc. in Sustainable Agriculture

(Course Code details: SA-Sustainable Agriculture,  
G-General Education,  
S- Skill Component  
1- Dr First Semester,  
1S-First Skill Paper,  
2S- Second Skill Paper,  
1G- First General Paper  
2G- Second General Paper

I- Internship/training/Project/Dissertation.

## Sustainable Agriculture (to be implemented from 2020-21)

### Semester-IV

Code	Paper	Credits	Lectures	L/Wk
<b>General Component</b>				
BUSAT41	Production Technology for Vegetables and Spices	3	45	3
BUSAT42	Fundamentals of Plant Pathology and Integrated Disease Management	3	45	3
BUSAT43	Basics of Entomology and Integrated Pest Management	3	45	3
BUSAT44	Communication Skill	3	45	3
<b>Skill Component</b>				
BUSAP41	Production Technology for Vegetables and Spices	4	120	8
BUSAP42	Fundamentals of Plant Pathology and Integrated Disease Management	4	120	8
BUSAP43	Basics of Entomology and Integrated Pest Management	4	120	8
BUSAP44	Communication Skill	4	120	8
BUSAP45	Yoga/ Fine arts/Basics of Mathematics II	2	60	4

**B. Voc. Sustainable Agriculture**  
**SEMESTER IV(General Component)**

**Paper I: Production Technology for Vegetables and Spices**

Code: BUSAT41

Credits: 3

Lectures: 45

Objectives:

- To enable the students to acquire knowledge of Production Technology for Vegetables and Spices

**Module 1**

Importance of vegetables & spices in human nutrition and national, international economy,

**Module 2**

Origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetables.

**Module 3**

Origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important spices.

**Module 4**

Packaging and marketing of vegetables and spices

## **Reference Books**

1. Vegetables-B. Choudhary
2. Vegetable Crops-T. K. Bose, M. G. Som and T. Kabir
3. Vegetable, Tuber and Spices-S.Thamburaj
4. Production technology of vegetable crops-S. P. Singh
5. Vegetables – Production Technology Astral International-Haldavnekar, P.C.; Parulekar, Y.R.; Mali, P.C. and Haldankar, P.M.
6. Major Spices of India-J.S.Pruthi
7. Minor Spices and Condiments-J.S.Pruthi
8. Introduction to spices and plantation crops-N.Kumar and others
9. Spice Crops Vol.I and Vol. II-Parthasarathi and Others



## **Paper II: Fundamentals of Plant Pathology and Integrated Disease Management**

Code: BUSAT42

Credits: 3

Lectures: 45

### **Objectives**

- To provide basic knowledge of fundamentals of plant pathology and integrated disease management

### **Module 1**

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. Terms and concepts in Plant Pathology, Pathogenesis, Cause and classification of plant diseases.

### **Module 2**

Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vascular bacteria, Phytoplasmas, Spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them.

### **Module 3**

Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

### **Module 4**

Ecological management of crop environment. Introduction to conventional pesticides for disease management. Survey surveillance and forecasting of plant diseases. Development and validation of IPM module. Implementation and impact of IPM, IPM module for diseases. Safety issues in pesticide use. Case histories of important IPM programs.

## Reference Books:

- 1) Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
- 2) Agrios, GN. 2010. Plant Pathology. Acad. Press.
- 3) Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur
- 4) Singh RS. 2008. Plant Diseases.8th Ed. Oxford & IBH. Pub.Co.
- 5) Singh RS. 2013. Introduction to Principles of Plant Pathology.Oxford and IBH Pub.Co.
- 6) Alexopoulos, Mims and Blackwel. Introductory Mycology
- 7) Mehrotra RS & Aggarwal A. 2007.Plant Pathology.7th Ed. Tata Mc Graw Hill Publ. Co. Ltd.
- 8) Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London.
- 9) Hull R. 2002. Mathews Plant Virology. 4th Ed. Academic Press, New York.
- 10) Verma JP. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
- 11) Goto M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.
- 12) Dhingra OD & Sinclair JB. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
- 13) Nene YL & Thapliyal PN. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi.
- 14) Vyas SC. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.
- 15) Rajeev K & Mukherjee RC. 1996. Role of Plant Quarantine in IPM. Aditya Books.
- 16) Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.
- 17) Singh RS & Sitaramaiah K. 1994. Plant Pathogens – Nematodes. Oxford & IBH, New Delhi.
- 18) Thorne G. 1961. Principles of Nematology. McGraw Hill, New Delhi.
- 19) Walia RK & Bajaj HK. 2003. Text Book on Introductory Plant Nematology. ICAR, New Delhi.
- 20) Stakman EC & Harrar JG. 1957. Principles of Plant Pathology. Ronald Press, USA.
- 21) Tarr SAJ. 1964. The Principles of Plant Pathology. McMillan, London.
- 22) Vander Plank, JE. 1975. Principles of Plant Infection. Acad. Press

23) Verma JP, Varma A & Kumar D. (Eds). 1995. Detection of Plant Pathogens and their Management. Angkor

Publ., New Delhi

24) Fox RTV. 1993. Principles of Diagnostic Techniques in Plant Pathology. CABI Nene YL & Thapliyal PN.

1993. Fungicides in Plant Disease Control. Oxford & IBH, New Delhi.

25) Palti J. 1981. Cultural Practices and Infectious Crop Diseases. Springer- Verlag, New York.

## **Paper III: Basics of Entomology and Integrated Pest Management**

Code: BUSAT43

Credits: 3

Lectures: 45

### **Objectives**

- To provide basic knowledge of insects pests and integrated pest management
- To get knowledge of Bio-fertilizers, Bio-control Agents and Bio-pesticides

### **Module 1**

Introduction and history of Entomology, Definition : Insect & Entomology, Characteristics of Class - Insecta Economic importance of insects : harmful, beneficial and productive insects.

Pests of national importance e.g. Locust, termite and white grub along with their extent of losses.

Integrated Pest Management (IPM): Introduction, history, importance, concepts, principles and tools of IPM. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.

### **Module 2**

Biofertilizers: Introduction and types and importance of biofertilizers, Biopesticides and bioagents in agriculture and organic farming system, Classification of biofertilizers microorganisms used in biofertilizers production.

The nitrogen cycle in Nature. Process of nodule formation, Role of Nif and Nod gene in Biological Nitrogen fixation, Cross inoculation groups amongst Rhizobium, Methods used for the studying selection of efficient strain of Rhizobium.

### **Module 3**

Strategies of marking and Registration with CIB of bioagents and biopesticides Importance of Trichoderma spp., Pseudomonas spp. and Bacillus spp. as biocontrol agents, Mechanism of disease control by these organisms, Bioagents. Types of disease controlled bioagents formulations, Effectiveness of bioagents against seed-borne and soil borne plant pathogens, Mass multiplication and packing.

### **Module 4**

Importance of Trichogramma, Cryptolaemus, Chrysoperla, NPV and entomofungal pathogens. Establishing insectary for host insects and natural enemies, Mass production of Verticillium/Beauveria/Metarhizium/Nomuraea/Paecilomyces/Hirsutella thompsonii/Trichoderma, /Pseudomonas/Bacillus/Potash Mobilizers/Sulphur oxidizers /organic matter decomposers

## Reference Books:

1. Alexander M. 1977. Soil Microbiology. John Wiley.
2. Bergerson F.J. 1980. Methods for Evaluating Biological Nitrogen Fixation. John Wiley and Sons.
3. Motsara, I.M.R., Bhattacharyya, P. and Srivastava, B. 1995. Biofertilizer Technology, Marketing and Usage- A Source Book-cum-glossary. FDCO, New Delhi.
4. Subba Rao, N.S. Biofertilizers in Agriculture and Forestry. 1993. Oxford and IBH. Publ. Co., New Delhi.
5. Burges, H.D. and Hussey, N.W. (1971). Microbial Control of Insects and mites. Academic Press, New York.
6. Burges, H.D. Formulation of microbial pesticides – Kluwersep, ACB, Dordrecht- ISBN. 0412 625 202.
7. Coppel H.C. and J.W. Martin. (1977). Biological control of insect pest suppression. Springail.
8. De Bach P. 1964. Biological control of Insect Pest and Weeds Chapman and Hall, New York.
9. Gautam, R.D. (2006). Biological suppression of insect pests. Kalyani Publisher, New Delhi.
10. Huffaker, C.B. and Messenger, P.S. (1976). Theory and Practice of Biological control. Academic Press, New York.
11. Ignacimuthu, S.S. and Jayaraj, S. (2003). Biological Control of Insect Pests. Phoenix Publ. New Delhi.
12. Saxena, A.B. (2003). Biological Control of Insect Pests. Anmol Publ. New Delhi.
13. Huffaker, C.B. and Messenger, P.S. (1976). Theory and Practice of Biological control. Academic Press, New York.
14. Pepper HJ and Perlman D. 1979. Microbial Technology. 2nd Ed. Academic Press.
15. A century of Nitrogen Fixation Research Present status and Future projects. 1987. F.J. Bergersen and J.R. Postgate The Royal Soc., London.
16. Biology and Biochemistry of Nitrogen fixation. 1991. M.J. Dilworth, and A.R. Glenn, Elsevier, Amsterdam.
17. Nitrogen Fixation in plants. 1986. R.O.D. Dixon, and C.T. Wheeler, Blackie USA, Chapman and Hall, New York.
18. A treatise on dinitrogen Fixation Section IV. Agronomy and Ecology 1977. R.W.F Hardy, and A.H. Gibson John Wiley & Sons, New York.

19. Bioresearches technology for sustainable agriculture. 1999. S. Kannaiyan, Assoc. Pub. Co., New Delhi.
20. Biofertilizer Technology, Marketing and usage- A source Book -cum-glossary 1995. Motsara, I. M.R., P. Bhattacharyya and Beena Srivastava, FDCO, New Delhi.
21. Symbiotic nitrogen fixation in plants, 1976. P.S. Nutman, Cambridge Univ. Press, London.
22. Handbook for Rhizobia; Methods in legume Rhizobium Technology, 1994. P. Somasegaran and H.J. Hoben Springer-Verlag, New York.
23. Biofertilizers in Agriculture and Forestry 1993. N.S. Subba Rao Oxford and IBH Publ. Co., New Delhi.

## **Paper IV: Communication Skills**

Code: BUSAT44

Credits: 3

Lectures: 45

### **Unit I: Listening**

- Difference between listening and hearing
- Parameters of listening
- Barriers to listening

### **Unit II: Speaking**

- Concept of effective Speaking
- Parameters of effective Speaking
- Barriers to speaking

### **Unit III: Reading**

Comprehension

### **Unit IV: Writing**

- Concept of business Correspondence
- Job application letter
- Sales, Enquiry Letter
- Business Emails & Blogs

**Evaluation Method: Case study**

**B. Voc. Sustainable Agriculture**  
**SEMESTER IV (Skill Component)**

**Paper I: Production Technology for Vegetables and Spices (Practical)**

Code: BUSAT 41

Credits: 4

Hours: 120

Objectives

- To get the skill of vegetables and spices cultivation and production
- 1. Identification of vegetable crops and their seeds (Solanaceous, Cucurbits, Okra)
- 2. Identification of vegetable crops and their seeds (Leguminous, leafy, Other)
- 3. Identification of spices crops and their seeds (Tree Spices)
- 4. Identification of spices crops and their seeds (Seed Spices and condiments)
- 5. Nursery raising
- 6. Direct seed sowing and transplanting
- 7. Study of morphological characters of different vegetables
- 8. Study of morphological characters of different spices
- 9. Fertilizers applications
- 10. Propagation and raising of the nursery of vegetables
- 11. Propagation and raising of the nursery of spices
- 12. Vegetables & spices seed extraction
- 13. Harvesting & preparation for market of vegetables
- 14. Harvesting & preparation for market of spices
- 15. Economics of vegetable cultivation
- 16. Economics of spices cultivation



## **Paper II: Fundamentals of Plant Pathology and Integrated Disease Management (Practical)**

Code: BUSAP 42

Credits: 4

Hours: 120

### Objectives

□ To study practical use of fundamentals of plant pathology and integrated disease management

1. Acquaintance with various laboratory equipment and microscopy
2. Study of symptoms of various plant diseases.
3. Study of representative fungal genera
4. Staining and identification of plant pathogenic bacteria
5. Study of phanerogamic plant parasites
6. Transmission of plant viruses
7. Study of morphological features and identification of plant-parasitic nematodes.
8. Study of fungicides and their formulations
9. Calculation of fungicide sprays concentrations.
11. Collection and preservation of disease specimen
12. Methods of diagnosis various plant diseases,
13. Methods of detection of various plant diseases
14. Assessment of crop yield losses
15. Identification of biocontrol agents
16. Mass multiplication of Trichoderma,
17. Mass multiplication of Pseudomonas,
18. Mass multiplication of NPV
19. Crop monitoring attacked by diseases

### **Paper III: Basics of Entomology and Integrated Pest Management (Practical)**

Code: BUSAP43

Credits: 4

Hours: 120

#### Objectives

- To provide basic knowledge of insects pests and integrated pest management
  - To get the skill to use Bio-fertilizers, Bio-control Agents and Bio-pesticides
1. Methods of collection and preservation of insects including immature stages
  2. Methods of pesticide application and their safe use
  3. Equipment, machinery and tools used for biofertilizers, Biopesticides and bioagents production.
  4. Media used for biofertilizers, Biopesticides and bioagents production.
  5. Isolation of Rhizobium from root nodules. Isolation of Azotobacter, Acetobacter, Beijernickia, Azospirillum. a. I. By dilution pour plate technique and II. By enrichment culture technique
  6. Isolation of BGA, PSB, Sulphur oxidizing microorganisms, ion chelator, potash mobilizers, organic matter decomposers
    - a. I. By dilution pour plate technique and II. By enrichment culture technique
  7. Estimating the efficiency of Rhizobium through pot culture experiments and through nodulation tests in test tubes and Leonard jar.
  8. Production of Rhizobium commercial biofertilizers of Azotobacter, Azospirillum, Acetobacter, organic matter decomposers
  9. Production of carrier biofertilizers of Sulphur oxidizing microorganisms, ion chelator, potash mobilizers
  10. Study of VA-mycorrhiza: growth on Guinea grassroots and observations for root colonization.
  11. Methods of preparation and application of VA-mycorrhizal inoculum
  12. Mass production of Trichogramma, Cryptolaemus, Crysoperla
  13. Mass production of HaNPV, SINPV and EPN
  14. Mass production of Verticillium/Beauveria/ Metarhizium/Nomuraea/ Paecilomyces/Hirsutella thompsoni/ Trichoderma
  15. Methods of application of biofertilizers, Biopesticides and bioagents
  16. Quality control of biofertilizers: ISI standards specified and estimating the viable bacterial count in carrier-based biofertilizers, Biopesticides and bioagents
  17. Quality control tests for the biofertilizers, Biopesticides and bioagents
  18. Visits to Commercial biocontrol units and Krishi Seva Kendra.

**Paper IV Communication Skills (Practical)**

Code: BUSAP 44

Credits: 4

Hours: 120

Listening Activities

Speaking

## **Paper V: Basics of Mathematics: Numerical Aptitude-II**

Code: BUBUS45

Credits: 2

Hours: 60

### Module 1 Equations

- Simple equation
- Simultaneous linear equations in two variables
- Problems leading to Simultaneous linear equations
- Method of Solving Simultaneous linear equations
- Graphical Solutions of Simultaneous linear equations

### Module 2 Polynomials -Quadratic and Cubic Equations

- Concept of Polynomials
- Roots of Quadratic and Cubic Equations
- Nature of Roots
- Relation between Roots and Coefficients

### Module 3 Sequence and Series –Arithmetic and Geometric Progressions

- Sequence
- Series
- Arithmetic Progressions
- Geometric Progressions
- Geometric Mean

### Module 4 Sets, Functions and Relations

- Sets
- Venn Diagrams
- Product Sets
- Functions and Relations
- Domain and Range
- Various types of functions

## Reference Books

- 1) Quantitative Aptitude, Board of Studies, the Institute of Chartered Accounts of India.
- 2) A textbook of Business Mathematics, S Chand Publications by Padmalochan Hazarika.
- 3) Quantitative Techniques S Chand Publications, by C Satyadevi.
- 4) A textbook of Business Statistics, S Chand Publications by Padmalochan Hazarika
- 5) Mathematical and Statistical analysis by R.J. Shah, Sheth Publication.
- 6) Mathematical and Statistical analysis by Welling, Saraph and Diwanji, Manan Publication.
- 7) Mathematics for Economics and Finance Methods and Modelling by Martin Anthony and Norman Biggs, Cambridge University Press, Cambridge low priced edition, 2000.
- 8) Business Mathematics by D. C. Sancheti and V. K. Kapoor, Sultan Chand & Sons, 2006.
- 9) Mathematics for Business Economics: By J. D. Gupta, P. K. Gupta and Man Mohan, Tata Mc Graw Hill Publishing Co. Ltd., 1987, Chapters 9 to 11 &16.
- 10) Quantitative Methods Part I By S. Saha and S. Mukerji, New Central Book Agency, 1996.
- 11) Mathematical Basis of Life Insurance by S.P. Dixit, C.S. Modi and R.V. Joshi, Insurance Institute of India.