

**SRI VENKATESWARA UNIVERSITY**  
**B.Sc. DEGREE COURSE IN ORGANIC FARMING**  
**IV- SEMESTER**

(Syllabus under CBCS w.e.f. 2021-22)

**Organic Farming Core Course - 4**  
**Principles of Agronomy**

(Total hours of teaching – 60 @ 04 Hrs./Week)

**Theory :**

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**Learning Outcomes :** On successful completion of this course, the students will be able to :

- Develop critical understanding on various aspects of agronomy.
  - Explain the nutrition and application of nutrients to plants.
  - Explain the cropping methods and crop rotation.
  - Realize various weed management practices.
  - Explain the different aspects of crop harvesting.
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**Unit – 1 :Basics of Agronomy**

1. Agronomy- definition, scope; role of Agronomist and relationship of Agronomy with other sciences.
2. Tillage - definition, objects of tillage, types of tillage, tillage implements and factors affecting tillage, Effect of tillage on soil and crop growth.
3. Tillage- definition, characteristics and ideal tillage; modern concepts of tillage, minimum, zero and stubble mulch tillage, importance of puddling.
4. Seed - definition, characteristics of quality seed, seed treatment and its objectives; methods of sowing seed and sowing implements.

**Unit – 2 :Crop communities**

1. Effect of plant population on growth and yield, planting geometry viz., solid, paired and skipped row planting.
2. Role of plant nutrients in crop production, Importance of manures and fertilizers and its classification.
3. Methods and time of application of manures, fertilizers and green manuring.
4. Nutrient use efficiency, meaning and factors affecting nutrient use efficiency.

**Unit – 3 :Growth and development**

1. Growth and development- definition, growth curve and factors affecting growth and development.
2. Plant ideotypes - definition and types of ideotypes.
3. Crop rotation, its definition, principles and advantages of crop rotation.
4. Study of crop adaptation and its distribution.

**Unit – 4 : Weed management**

1. Weeds, its definition, characteristics of weeds, merits and demerits of weeds.
2. Classification of weeds, meaning of crop weed competition and its period in different crops.
3. Principles and methods of weed management viz., cultural, mechanical, chemical, biological weed control methods and integrated weed management.
4. Classification of herbicides, its selectivity and resistance, Allelopathic effect of weed.

## **Unit – 5 :Crop harvesting**

1. Crop harvesting, signs of maturity in different field crops; physiological and crop maturity.
2. Methods of threshing crops, cleaning, drying and storage of field crops.
3. Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India.
4. Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas.

### **Books for Reference :**

- **Gopal Chandra De. 1980.**, Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.
- **Panda, S.C., 2006.** Agronomy, Agribios Publication, New Delhi.
- **Reddy, S.R. 2011.** Principles of Agronomy Kalyani Publishers, Ludhiana, India.
- **Sankaran, S. and V.T. Subbiah Mudliyar, 1991.** Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
- **Rao V.S., 2006.** Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.

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**Practical syllabus of Organic Farming Core Course – 4**  
**Principles of Agronomy**

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

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**Course outcomes :**On successful completion of this course, the students shall be able to :

- Study and record the growth parameters in plants in relation to agro-climatic conditions.
  - Apply fertilizers and pesticides as per the requirement at different stages of crop growth.
1. Identification of seeds and crop plants at different growth stages.
  2. Identification of different tillage implements.
  3. Identification of fertilizers and pesticides.
  4. Identification of weed flora in different field crops.
  5. Study of agro climatic zones of Andhra Pradesh and India.
  6. Operational tillage viz., primary, secondary, inter-tillage, sowing, harvesting, harvesting implements, Working with them.
  7. Calculation of plant population, seed rate, fertilizer and herbicide dose for different field crops.
  8. Determination of purity and germination percentage of seed, Methods of seed germination.
  9. Study of viability test and practice of seed treatments in different field crops.
  10. Study of yield contributing characters and yield estimation in different field crops.
  11. Methods of application of herbicides in different field crops.
  12. Measurement of air and soil temperatures, tabulation and variation extended.

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**Model Question Paper for Practical Examination**

Organic Farming Core Course – 4

**Principles of Agronomy**

Max. Time: 3 Hrs.

Max. Marks: 50

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|---|--------------|
| 1. Experiment 'A' (Operational tillage)   | 10 M         |
| 2. Experiment 'B' (Calculation of plant population, seed rate, fertilizer and herbicide dose for a field crop). | 10 M         |
| 3. Experiment 'C' (Seed germination/viability test)   | 10 M         |
| 4. Identify the following and justify with reasons<br>D. Seed/tillage implement<br>E. Fertilizer/pesticide/weed | 2 x 5 = 10 M |
| 5. Record + Viva voce   | 5 + 5 = 10 M |

**Suggested co-curricular activities for Organic Farming Core Course -4 in Semester-IV:**

**A. Measurable :**

**a. Student seminars :**

1. Water Resources of India and Andhra Pradesh and Development.
2. Soil- water-plant Relationship.
3. Classification of Soil Water, Soil Moisture Constants, Soil Moisture characteristic Curve.
4. Water requirement of different Agronomic crops.
5. Water Use efficiency of crops, Irrigation Efficiencies and factors affecting it.
6. Crop management techniques in problematic areas i.e. saline, alkaline, acidic soils.
7. Study of Drip System, Fertigation, Care and Maintenance of Drip system.
8. Study of Pressurized irrigation system, Sprinkler, Rain gun.
9. Top dressing and foliar feeding of nutrients.
10. Studies on cropping pattern of different rainfed areas in the country.
11. Drought - classification and effect on crop growth.
12. Post-harvest management in Organic Farming.

**b. Student Study Projects:**

1. Morphological description of kharif season crops.
2. Morphological description of rabi season crops.
3. Study of yield contributing characters and yield calculation of a kharif season crop.
4. Study of morphological characteristics of rabi crops.
5. Identification of weeds in rabi season crops.
6. Study of yield contributing characters of rabi season crops.
7. Study the effect of seed size on germination and seedling vigour of kharif season crops.
8. Study the effect of seed size on germination and seedling vigour of rabi season crops.

**c. Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.
2. Visit to research centers of related crop; Visit to rainfed research station/ watershed areas.

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**Organic Farming Core Course - 5**  
**Biofertilizers and Biopesticides**

(Total hours of teaching – 60 @ 04 Hrs./Week)

**Theory :**

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**Learning Outcomes :** On successful completion of this course, the students will be able to :

- Realize the importance of ecofriendly fertilizers and pesticides.
  - Demonstrate skills on culture and mass production of biofertilizers and biopesticides.
  - Acquire sound knowledge on application of the biofertilizers and biopesticides for various crops.
  - Study the efficacy of biofertilizers and biopesticides in organic farming.
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**Unit – 1 : Basics of Biofertilizers** **12 Hrs.**

1. Biofertilizers – definition, importance and advantages.
2. Sources of Biofertilizers - Bacteria, Cyanobacteria, Mycorrhiza and PSM.
3. Outlines of production technology of biofertilizers- isolation, selection of strain, preparation of mother culture, starter culture, mass culturing.
4. *Rhizobium* – Mass multiplication, starter culture, mass cultivation, inoculant formulations and application method.

**Unit – 2 : Culture of Bacterial and fungal Biofertilizers** **12 Hrs.**

1. *Azotobacter*- Mass multiplication, maintenance of culture, application and crop response.
2. *Azospirillum* - Mass multiplication, inoculant formulations, associative effect and crop response.
3. *Anabaena*- Characteristics, *Azolla-Anabaena* association, *Azolla* production and application.
4. VAM- mass production - substrate, substrate free, in-vitro methods and crop response.

**Unit – 3 : Biofertilizer Production Technology** **12 Hrs.**

1. PSM- Isolation, mass inoculum production and field application.
2. Culturing of microorganisms: Fermentation Method-Bioreactor and protocol.
3. Inoculant formulations – Carrier properties, Types of formulations: Powders, Granules and Liquids.
4. Quality Management: Output quality standards- Viable cell count, contamination level, Density of strain, effect on target crop.

**Unit – 4 : Botanical and fungal biopesticides** **12 Hrs.**

1. Biological control agents and their characteristics.
2. Types of biopesticides – bacterial, fungal and viral; advantages and disadvantages.
3. Properties of botanical biopesticides; pesticide products in *Azadirachta*, *Pongamia* and *Annona*.
4. Characteristics of biological fungicides-*Trichoderma*, *Pseudomonas* and *Fusarium* species; production and processing of biological fungicides.

**Unit – 5 :Bioinsecticides and nematicides****12 Hrs.**

1. Mode of action of biological insecticides and nematicides.
2. Characteristics of biological insecticides-*Bacillus thuringiensis*, *Metrhizium*, and *Beauvariabassina*; Ha – NPV and SL-NPV
3. Production and processing of biological insecticides.
4. Biological nematicides – *Baciilusfirmus*and *Paecilomycislilacinus*.

**Books for Reference :**

- Kannaiyan, S., 2003. Bioetchnology of Biofertilizers, CHIPS, Texas.
- Mahendra K. Rai, 2005. Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
- Reddy, S.M. et. al., 2002. Bioinoculants for sustainable agriculture and forestry, Scientific Publishers, Jodhpur.
- SubbaRao N.S., 1995 Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. New Delhi.
- Saleem, F.and A.R. Shakoori, 2012. Development of Bioinsecticide, Lambert Academic Publishing, Latvia, European Union.

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**Practical syllabus of Organic Farming Core Course – 5**  
**Biofertilizers and Biopesticides**  
(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

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**Course outcomes :** On successful completion of this course, the students shall be able to :

- Handle the equipment and tools to produce biofertilizers and to apply biopesticides.
- Culture microbes used as biofertilizers and biopesticides.
- Estimate the application dosage of biofertilizers and biopesticides for a crop.
  1. Study of equipment for production of bio-fertilizers.
  2. Isolation and culture techniques of 3 types of biofertilizers as per the theory syllabus
  3. Characteristics, isolation and identification of *Rhizobium*, *Azotobacter* and *Azospirillum*.
  4. VAM- isolation and inoculum production.
  5. Identification of biological control agents.
  6. Isolation and culture of *Trichoderma*, *Pseudomonas* and *Fusarium* species.
  7. Isolation and culture of *Bacillus thuringiensis*, *Metrhizium*, *Beauvariabasina*.
  8. Study of *Ha – NPV* and *SL-NPV*.
  9. Demonstration of application equipments for biopesticides.
  10. Calculations of dosage and application technique of biopesticides.



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**Model Question Paper for Practical Examination**  
**Organic Farming Core Course – 5**  
**Biofertilizers and Biopesticides**

Max. Time: 3 Hrs.

Max. Marks: 50

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|--|--------------|
| 1. Experiment 'A' (Isolation and culture of a biofertilizer)               | 10 M         |
| 2. Experiment 'B' (VAM- isolation and inoculum production).                | 10 M         |
| 3. Experiment 'C' (Isolation and culture of fungal/bacterial insecticide). | 10 M         |
| 4. Identify the following and justify with reasons                         | 2 x 5 = 10 M |
| D. Equipment for Biofertilizer production.                                 |              |
| E. Equipment for application of Biopesticide.                              |              |
| 5. Record + Viva voce  | 5 + 5 = 10 M |

**Suggested co-curricular activities for Organic Farming Core Course -4 in Semester-IV:**

**A.Measurable :**

**a. Student seminars:**

1. Chemical fertilizers – environmental issues and human health hazards.
2. Comparison of chemical fertilizers, organic manures and Biofertilizers.
3. Ditrification and role of Nitrogenase.
4. Free living, asymbiotic and symbiotic nitrogen fixers.
5. Phosphate Solubilizing Microbes (PSM).
6. Physiology and Genetics of Nitrogen fixation.
7. Environmental issues and human health hazards due to chemical pesticides.
8. Comparison of chemical and biopesticides.
9. Microbial diseases of crop plants.
10. Economics of chemical vs biopesticides.

**b. Student Study Projects:**

1. Isolation, identification and culture of free living and asymbiotic Nitrogen fixers from local crop fields.
2. Isolation, identification and culture of symbiotic Nitrogen fixers from legume and non-leguminous plants in a locality.
3. Isolation, identification and culture of Phosphate Solubilizing Microbes from a local crop field.
4. Isolation and identification of Mycorrhiza associated with some local plants.
5. Isolation, identification and culture of Denitrifying bacteria from a local crop field.
6. A report on efficacy of Botanical pesticides on a plant pathogen.
7. A report on efficacy of Biopesticide on a plant pathogen.
8. A report on efficacy of Bioinsecticide on an insect pest.
9. A study report on application of Biofertilizers in India and Andhra Pradesh.
10. A study report on application of Biopesticides in India and Andhra Pradesh.

**c. Assignments:** Written assignment at home / during '0' hour at college; preparation

of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.
2. Visit to research centers and firms making Biofertilizers and Biopesticides.

**RECOMMENDED ASSESSMENT OF STUDENTS:**

**Recommended continuous assessment methods for all courses:**

Some of the following suggested assessment methodologies could be adopted. Formal assessment for awarding marks for Internal Assessment in theory.

**(a) Formal:**

1. The oral and written examinations (Scheduled and surprise tests),
2. Simple, medium and Critical Assignments and Problem-solving exercises,
3. Practical assignments and laboratory reports,
4. Assessment of practical skills,
5. Individual and group project reports,
6. Seminar presentations,
7. Viva voce interviews.

**(b) Informal:**

1. Computerized adaptive testing, literature surveys and evaluations,
2. Peers and self-assessment, outputs from individual and collaborative work
3. Closed-book and open-book tests,

**Common pattern for Question Paper for Theory Examination(s) at Semester end**

Max. Time : 3 Hrs.

Max. Marks : 75 M

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**Section – A**

**Answer all the following questions.**

**5 x 2 = 10 M**

- ✓ One question should be given from each Unit in the syllabus.

**Section – B**

**Answer any three of the following questions. Draw a labeled diagram wherever necessary**

**3 x 5 = 15 M**

- ✓ One question should be given from each Unit in the syllabus.

**Section – C**

**Answer any five of the following questions. Draw a labeled diagram wherever necessary**

**5 x 10 = 50 M**

- ✓ Two questions (a & b) are to be given from each Unit in the syllabus (internal choice in each unit). Student has to answer 5 questions by choosing one from a set of questions given from a Unit.

**Note :** Questions should be framed in such a way to test the understanding, analytical and creative skills of the students. All the questions should be given within the frame work of the syllabus prescribed.

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***Annexure***

**Objectives and General Outcomes of Programme and Domain Subject**

**Programme (B.Sc.) Objectives:** The objectives of bachelor's degree programme with Organic Farming are:

1. To provide a through insight on various aspects related to Organic Farming.
2. To inculcate a sound knowledge on latest developments in the field of Organic Farming with a practical approach.
3. To produce a student who thinks independently, critically and discuss various aspects of Organic Farming.
4. To enable the graduate to prepare and pass through various examinations related to the domain subject.
5. To empower the student to become an employee or an entrepreneur in the field of Organic Farming and to serve the nation.

**Programme Outcomes :**

1. Understand the basic concepts of Organic Farming in relation to its allied core courses.
2. Decide the importance of Organic Farming for the welfare of humans.
3. Demonstrate simple experiments related to plant sciences, analyze data, and interpret them with the theoretical knowledge.
4. Work in teams with enhanced inter-personal skills and hence develop the critical thinking with scientific temper.

5. Effectively communicate scientific ideas both orally and in writing.
6. Realize the potential of the horticulture to become an entrepreneur – self employment.

**Domain Subject (Organic Farming) Objectives :**

1. To create awareness on various principles Organic Farming.
2. To teach cultivation practices for various crops cultivated using organic farming methods.
3. To provide in depth knowledge on importance of soil microbes in farming.
4. To provide a practical experience on agronomic principles for cultivation of plants under different agro-climatic regions.
5. To give sufficient knowledge on pests and diseases of horticulture plants and measures to control the same.

**Domain Subject (Horticulture) Outcomes:**

1. Students will be able to design, execute the establishment and manage an organic farm for a crop.
  2. Students will be able to cultivate crops using principles of organic farming.
  3. Students will be able study the soil biota of a given region.
  4. Students will be able to discuss various agronomical aspects of a given crop species.
  5. Students will be able discuss various aspects related to production and use of biofertilizers and biopesticides.
  6. Students will be able to examine, identify and control different pests and diseases of plants in an organic farm.
  7. Students will think independently and may become an employ in the said sector or may become an entrepreneur by taking up organic farming.
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