RAFFLES UNIVERSITY

TEACHING PLAN: Bio-Pesticides and Bio-Fertilizers

SCHOOL: (SOAS) SCHOOL OF AGRICULTURAL SCINCES		**ACADEMIC SESSION: 2023 – 2024**		**FOR STUDENTS' BATCH: 2021-2025**	
1	**Course No.**	**AET-T-302**			
2	**Course Title**	**Bio-Pesticides and Bio-Fertilizers**			
3	**Credits**	**1+1**			
4	**Learning Hours**	**Contact Hours** 72 **Assessment** 9 **Guided Study** 9 **Total hours** 90			
5	**Course Objective**	**1.** To learn about the importance of Bio pesticides **2.** To provide knowledge of Mass production technology of bio-pesticides **3.** To learn about the importance of Bio fertilizers **4.** To learn Nitrogen fixation -Free living and symbiotic nitrogen **5.** To study the Structure and characteristic features of bio fertilizers			
6	**Course Outcomes**	1. To acquaint with the importance of bio-pesticides in present scenario. 2. To educate about concept and classification of bio-concepts. 3. Role of bio-fertilizers in quality parameters of various agricultural products and key role of bio-fertilizer in maintain soil health.			
7	**Outline syllabus:**				
7.01	**Paper Code**	**Unit**	**Introduction**	**Page Numbers[1]**	**Lectures**
7.02	**AET-T-302**	**Unit I**	**1.** History and concept of bio-pesticides. **2.** Importance, scope and potential of bio-pesticide. **3.** Definitions, concepts and classification of bio-pesticides viz. pathogen, botanical pesticides, and biorationales. **4.** Botanicals and their uses. **5.** Mass production technology of bio-pesticides. **6.** Virulence, pathogenicity and symptoms of entomo-pathogenic pathogens and nematodes. **7.** Methods of application of bio-pesticides. **8.** Methods of quality control and Techniques of bio-pesticides. **9.** Impediments and limitation in production and use of bio-pesticide.	Self-notes	**1** **1** **2** **1** **1** **2** **2** **1** **1**
		Unit II	1. Biofertilizers - Introduction, status and scope. 2. Structure and characteristic features of bacterial biofertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; 3. Cynobacterialbiofertilizers- *Anabaena*, *Nostoc*, 4. Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.	Self-notes	**1** **2** **2** **2**
		Unit III	1. Nitrogen fixation -Free living and symbiotic nitrogen fixation. 2. Mechanism of phosphate solubilisation and		**2** **1**

			phosphate mobilization, 3. K solubilisation. 4. Production technology: Strain selection, sterilization, growth and fermentation. 5. Mass production of carrier based and liquid biofertiizers.	Self-notes	**1** **2** **1**
		Unit IV	1. FCO specifications and quality control of biofertilizers. 2. Application technology for seeds, seedlings, tubers, sets etc. 3. Biofertilizers -Storage, shelf life, quality control and marketing. 4. Factors influencing the efficacy of biofertilizers.	Self-notes	**1** **1** **2** **1**

8	**Course Evaluation**	
8.1	**CA: 10%**	
8.1.1	**Attendance**	25 %
8.1.2	**Homework**	2 Assignments, 50%
8.1.3	**Quizzes**	2 Quizzes, 25%
8.1.4	**Projects**	-
8.1.5	**Presentation**	-
8.1.6	**Any other**	Practical Examination- 30%
8.2	**MTE**	10%
8.3	**End-term examination: 50%**	
9	**Text Books & References**	
9.1	**Text book**	**1. Field crops Production, Foodgrain crops Volume-I, by Dr. Rajendra Prasad, Indian Council of Agricultural Research, New Delhi.** **2. Field crop Production, Commercial crops Volume-II by Dr. Rajendra Prasad, Indian Council of Agricultural Research, New Delhi.**
9.2	**References**	1. Principles of Crop production, by Reddy SR, Kalyani publications. 2. Modern techniques of raising field crops ChhiddaSingh,Prem Singh and Rajbir Singh 3. Crops of India N.R.Das 4. Principles Of Crop Production, by S.R REDDY, C NAGAMANI, Kalyani Publications. 5. A Manual on Crop Production Technology (Kharif and Kharif), Lokesh Kumar Jain 6. Agronomy of field crops S.R.Reddy. **7. Crop Production Technology I & II – Kharif and Rabi Crops – As per 5th Deans Committee Recommendations, B. S. Lalitha, N. Mavarkar, B. R. Premalatha, 2020**
9.3	**Video References**	1. https://courseware.cutm.ac.in/wp-content/uploads/2020/06/Lec-11-Biofertilizer-and-biopesticide.pdf 2.

Outcome no. → Syllabus topic↓	1	2	3	4	5
Paper Code.Unit I (1)	✓				✓
Paper Code. Unit I (2)	✓	✓	✓	✓	
Paper Code. Unit I (3)	✓	✓	✓	✓	
Paper Code.Unit II (1)	✓	✓	✓	✓	
Paper Code. Unit II(2)	✓	✓	✓	✓	
Paper Code. Unit II(3)	✓	✓	✓	✓	
Paper Code.Unit III (1)	✓	✓	✓	✓	
Paper Code.Unit III (2)	✓	✓	✓		
Paper Code.Unit IV (1)	✓	✓	✓		
Paper Code.Unit IV (2)	✓	✓	✓	✓	✓
Paper Code.Unit IV (3)	✓	✓	✓		✓
Paper Code.Unit IV (4)	✓	✓	✓		✓
Paper Code.Unit IV (5)	✓	✓	✓		
Paper Code.Unit IV (6)	✓	✓	✓		
Paper Code.Unit IV (7)	✓	✓	✓	✓	

QUESTION BANK

Section A

(a) Pathogen
(b) Virulence
(c) Nematodes
(d) Symbiosis
(e) Neem
(f) PSB
(b) Tobacco
(c) Congress Grass
(d) Safeda
(e) NSKE
(f) Jeevamrit
(g) Bio-pesticides
(h) Bio-fertilizers
(i) IPM
(j) IDM

1. Write the short note on the following-
    a) *Azotobactor*
    b) *Azospirillum*
    c) *Bacillus*
    d) *Pseudomonas*
    e) *Rhizobium*
    f) *Anabaena*
    g) *Nostoc*
    h) *Blue green algae (BGA)*
2. Write down the types of Biopesticides?
3. Write down the types of Biofertilizers?
4. Discus on green manuring crops?
5. Discus on benefits of Biopesticides?
6. Discus on benefits of Biofertilizers?
7. Write down the disadvantages of Biopesticides?
8. Write down the disadvantages of Biofertilizers?
9. In list some Biopesticides for different vegetables?
10. In list some Biopesticides for different Cereals.
11. In list some Biopesticides for different Pulses.
12. In list some Biopesticides for different Oilseeds.
13. In list some Biopesticides for different grasses.
14. In list some Biofertilizers for different Cereals.
15. In list some Biofertilizers for different Pulses.
16. Write down the complete process of NSKE?
17. Discus on potential of bio-pesticides market in India?
18. Discus on potential of bio-fertilizers market in India?
19. Discuss the role of *Rhizobium* culture in Pulses crops.
20. Discuss the importance of *BGA* in Rice.
21. Discuss the importance of *Azotobactor* in Wheat (Cereals).
22. Discuss the history and concept of Biopesticides in India.

23. Discuss the importance and scope of biopesticides.
24. Explain the production technology of biopesticides.
25. Explain the symptoms of entomo-pathogenic pathogens.
26. Write in detail about the methods of application of biopesticides.
27. Explain the methods of quality control and techniques of biopesticides.
28. Discuss the status and scope of Biofrtilizers.
29. Write down the characteristics and structure of Azotobactor.
30. Explain about the free living and symbiotic nitrogen fixation.
31. Explain the mechanism of phosphate solubilization.
32. Explain the production technology of liquid biofertilizers.
33. Explain the application technology of biofertilizers for seeds, seedlings and tubers.
34. Discuss the storage and shelf life of biofertilizers.
35. Discuss the Quality control and marketing of biofertilizer.
36. Discuss the factors influencing the efficacy of biofertilizers.

QUESTION BANK Unit -I

A. MCQs

1. Which of the following is incorrectly matched?

a) Alnus – *Frankia*
b) Alfalfa – *Rhizobium*
c) Nitrogen fixer – *Anabaena*
d) Mycorrhiza – *Rhodospirrilum*

2. What is the name of Bio control agent used for mass production?

a) Trichoderma
b) Alternaria
c) Rhizopus
d) All of these

3. Which of the following is not a biofertilizer?

(a) Mycorrhiza

(b) *Rhizobium*

(c) *Agrobacterium*

(d) *Nostoc*

4. Which of the following is used as a biofertilizer for soybean crop?

(a) *Nostoc*

(b) *Azospirillum*

(c) *Rhizobium*

(d) *Azotobacter*

5. Which of the following is commonly used as a nitrogen fixer in paddy fields?

(a) *Frankia*

(b) *Oscillatoria*

(c) *Azospirrilum*

(d) *Rhizobium*

B. Short Questions

Write the shorts notes on following questions

1. Discuss the history of biopesticide
2. Write in detail Importance of bio fertilizers
3. Write the scope and potential of bio-pesticide.
4. classification of bio-pesticides
5. Discus in brief Concept of bio-pesticides
6. What is the role of Botanicals and write their use in Agriculture.
7. Mass production technology of bio-pesticides.
8. What are the Methods of application of bio-pesticides?

C. Long questions

3. Descriptive questions

1. How the Botanicalpesticides affect plant pathogens, and write the role of Botanicalspesticide inplant diseases management.
2. What do you mean by Virulence, describe in detail about pathogenicity and write the symptoms of entomo-pathogenic nematodes.
3. Write the Methods of quality control for mass production of bio agents and write the Techniques of bio-pesticides.
4. Write down the details of Impediments and limitation in production and use of bio-pesticide.
5. In list some Biofertilizers for different vegetables and write down the complete process of JEEVAMARIT?

QUESTION BANK Unit -II

A. MCQs

1. Which of the following nitrogen fixers is found in rice fields associated with *Azolla*?

(a) *Tolypothrix*

(b) *Frankia*

(c) *Anabaena*

(d) *Spirulina*

2. **This is not used in organic farming**

(a) snail

(b) Earthworm

(c) *Oscillatoria*

(d) *Glomus*

3. Which of the following is a nitrogen fixer in the root nodules of *Alnus*?

(a) *Clostridium*

(b) *Bradyrhizobium*

(c) *Azorhizobium*

(d) *Frankia*

4. Which of the following is a pair of biofertilizers?

(a) *Salmonella* and *E.coli*

(b) *Rhizobium* and grasses

(c) *Nostoc* and legume

(d) *Azolla* and BGA

5. Which of the following fern is a biofertilizer?

(a) *Salvinia*

(b) *Azolla*

(c) *Pteridium*

(d) *Marsilea*

B. Short Questions

Write the shorts notes on following questions

1. Describe in detail about basic principles of disease management.
2. Write the role of Bio fertilizers in agriculture
3. Write the Introduction, status and scopeof Bio fertilizers.
4. Describe in detail Structure and characteristic features of bacterial bio fertilizers-,
5. Write the name and characteristic of fungal bio fertilizers.

C. Long questions

Descriptive questions

1. Write the role of Azospirillum *andAzotobacter*in soil, and how they improve the soil fertility give in detail account.
2. Write the advantages and disadvantages of following Bio-control agents.
   - ***a)*** *Bacillus,*
   - ***b)*** *Pseudomonas,*
   - **c)** *Rhizobium*
   - **d)** *Frankia*
   - **e)** Cynobacteria
3. Write the role of Bio fertilizers in agriculture
4. Write the Introduction, status and scope of Bio fertilizers.
5. Describe in detail about mycorrhiza and write the characters of endomycorrhiza and ectomycorrhiza.
6. Write in detail about AM mycorrhiza

QUESTION BANK Unit -III

A. MCQs

1. Which of the following is an endomycorrhiza?

(a) *Rhizobium*

(b) *Agaricus*

(c) *Glomus*

(d) *Nostoc*

2. Pick the correct statement

(a) Legumes do not fix nitrogen

(b) Legumes fix nitrogen independent of bacteria

(c) Legumes fix nitrogen through bacteria in their roots

(d) Legumes fix nitrogen through bacteria in their leaves

3. Organic farming is the technique of raising crops through the usage of

(a) Resistant varieties

(b) Manures

(c) biofertilizers

(d) all of the above

4. A biofertilizer involving a pteridophyte host is

(a) *Azotobacter*

(b) *Clostridium*

(c) *Anabaena*

(d) *Rhizobium*

5. Which of the following plants form a symbiotic relationship with two nitrogen-fixing bacteria Rhizobium and Aero rhizobium in root and stem nodules respectively?

(a) *Sesbaniarostrata*

(b) *Crotalaria juncea*

(c) *Sesbaniaaculeata*

(d) *Cyamopsistetragonoloba*

6. This plant is used in sandy soils and as green manure in crop fields

(a) *Lantana camara* and *Saccharummunja*

(b) *Phyllanthusniruri* and *Calotropisprocera*

(c) *Azollapinnata* and *Dichanthiumannulatum*

(d) *Alhagicamelorum* and *Crotalaria juncea*

A. Short questions

Write the shorts notes on following questions

6. Describe the about K solubilisation.
7. Write in detail about freeliving nitrogen fixation.
8. Briefly describe the symbiotic nitrogen fixation.
9. Write the importance of Strain selection.
10. Write the importance of biofertiizers.

B. Long questions

Descriptive questions

1. Give the detail aboutmass production of carrier based and liquid bio fertilizers.
2. Inscribe about the mechanism of phosphate solubilisation.
3. Inscribe about the mechanism of phosphate mobilization
4. Describe the effect of bio fertilizers on soil.
5. Briefly describe the diagram of Nitrogen fixation.

Projects / Assignment (To be given to group of students)

1. Note: Each group of Students should submit 50 pressed and well-mounted specimens.