



Sri Venkateswara University, Tirupati

**Syllabus for MICROBIOLOGY Major in consonance with Curriculum frame work
w.e.f. AY 2026-27**

COURSE STRUCTURE (for Semester IV)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	IV	8	Basics of Immunology	3	3
			Basics of Immunology-Practical	2	1
		9	Medical Microbiology	3	3
			Medical Microbiology-Practical	2	1
		10	Agricultural Microbiology	3	3
			Agricultural Microbiology-Practical	2	1

Chairman Board of Studies (PG)
MICROBIOLOGY
S.V. UNIVERSITY
TIRUPATI-517 502 A.P.

SEMESTER-IV
COURSE 10: AGRICULTURAL MICROBIOLOGY
Theory Credits: 3 3 hrs/week

I. Learning Objectives:

1. Explore soil as a microbial habitat and summarize microbial diversity and interactions.
2. Classify microbial and viral virulence factors and illustrate plant defense mechanisms.
3. Compare strategies for controlling plant diseases, including chemical, biological, and genetic methods.
4. Identify plant diseases caused by fungi, bacteria, viruses, and viroids, and outline their symptoms and spread.
5. Evaluate the role of beneficial microbes in promoting plant growth and managing pests.

II. Course Outcomes: On completion of this course, students will be able to:

1. To study the soil properties, explore microbial diversity, and outline microbial interactions.
2. Categorize virulence factors and depict plant defense mechanisms.
3. Compare disease management strategies and demonstrate GM crop applications.
4. Study the major plant diseases and examine their symptoms and spreading mechanisms.
5. Differentiate biofertilizers and bioinsecticides and appraise their use in agriculture.

III. Syllabus of Theory:

Unit 1: Soil Microbiology

9 Hrs

1. Soil as Microbial Habitat, Soil profile and properties, Soil formation, Diversity and distribution of microorganisms in soil.
2. Mineralization of cellulose, hemicelluloses, lignocelluloses, lignin, and humus.
3. Microbial interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation. Microbe-Plant interaction: Symbiotic and non-symbiotic interactions.

Unit 2: Host Pathogen Interaction

9 Hrs

- 2.1. Microbial Pathogenicity: Bacterial virulence factors- enzymes, toxins (host-specific and non-specific), growth regulators; Viral virulence factors: replicase, coat protein, silencing suppressors
- 2.2. Effects on Host Physiology: Impact on photosynthesis, respiration, cell membrane permeability, nutrient and water translocation, growth, and reproduction.
- 2.3. Defense Mechanisms in Plants: Concepts of constitutive defenses; Inducible structural defenses: cork layer, abscission layer, tyloses, gums; Inducible biochemical defenses: hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins; pathogenesis-related (PR) proteins.

Unit 3: Plant Diseases control**9 Hrs**

- 3.1. Principles and Practices of Disease Management: Regulatory methods- quarantine, avoidance of pathogens, use of pathogen-free propagative material; Cultural methods: host eradication, crop rotation, sanitation.
Chemical methods: systemic fungicides, antibiotics; development of pathogen resistance.
- 3.2. Biological Control: Antagonistic microbes (bacteria and fungi).
- 3.3. Genetic Engineering of Disease-Resistant Plants: Use of plant-derived and pathogen-derived genes; Development of genetically modified (GM) crops (BT)

Unit: 4: Study of Plant diseases**9 Hrs**

Study of selected plant diseases with emphasis on etiological agent, symptoms, epidemiology, and control:

4.1 Diseases Caused by Fungi:

- a) Black stem rust of wheat – *Puccinia graminis tritici*
- b) Wilt of tomato – *Fusarium oxysporum* f. sp. *Lycopersici*
- c) Early blight of potato – *Alternaria solani*

4.2 Diseases Caused by Phytopathogenic Bacteria: bacterial blight of rice, crown galls, bacterial cankers of citrus

- 4.3. Diseases caused by viruses and viroids: Papaya ring spot, tomato yellow leaf curl.
diseases caused by viroids: Potato spindle tuber, coconut cadang- cadang

Unit 5: Biofertilization, Phytostimulation, Bioinsecticides No of Hrs: 9

- 5.1. Plant growth-promoting bacteria and biofertilizers – symbiotic (*Bradyrhizobium*, *Rhizobium*, Non Symbiotic (*Azospirillum*, *Phosphate solubilizers*)
- 5.2. Mycorrhizal Inoculum: Types of mycorrhizae, associated plants, Mass production of VAM (Vesicular-Arbuscular Mycorrhiza), field applications of Ectomycorrhizae and VAM.
- 5.3. Bioinsecticides: Advantages over synthetic pesticides, *Bacillus thuringiensis*-production and field applications; Viruses-Baculoviruses cultivation and field applications.

III. Co-curricular activities:

1. Collect soil samples, observe microbial diversity, and present findings.
2. Create posters or models of microbial disease control strategies and present them.
3. Prepare charts of plant diseases or visit a farm to observe and discuss them.

V. Reference Books:

1. Agarwal, S. K. (2005). *Advanced Environmental Biotechnology*. APH Publishing.
2. Agrios, G. N. (2006). *Plant Pathology* (5th ed.). Academic Press, San Diego.
3. Bagyaraj, D. J., & Rangaswami, G. (2005). *Agricultural Microbiology*. Prentice Hall of India Pvt. Ltd.
4. James, A. (2021). *Soil and Agricultural Microbiology*. Ed-Tech Press.
5. Lacomme, C. (Ed.). (2025). *Plant Pathology: Techniques and Protocols* (2nd ed.). Springer.

6. Lucas, J. A. (1998). *Plant Pathology and Plant Pathogens* (3rd ed.). Blackwell Science, Oxford.
7. Mahindra, K. Rai. (2005). *Handbook of Microbial Biofertilizers*. The Haworth Press, New York.
8. Mehrotra, R. S. (1994). *Plant Pathology*. Tata McGraw-Hill Limited.
9. Reddy, S. M., et al. (2002). *Bioinoculants for Sustainable Agriculture and Forestry*. Scientific Publishers.
10. Rangaswami, G. (2005). *Diseases of Crop Plants in India* (4th ed.). Prentice Hall India Pvt. Ltd., New Delhi.
11. Salem, F., & Shakoori, A. R. (2012). *Development of Bioinsecticide*. Lap Lambert Academic Publishing GmbH KG.
12. Singh, K. P., Jahagirdar, S., & Sarma, B. K. (Eds.). (2020). *Emerging Trends in Plant Pathology*. Springer.
13. Singh, R. S. (1998). *Plant Diseases Management* (7th ed.). Oxford & IBH, New Delhi.
14. Subba Rao, N. S. (1995). *Soil Microorganisms and Plant Growth*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
15. Subba Rao, N. S. (2009). *Soil Microbiology*. Oxford and IBH Publishing Company.
16. Kannaiyan, S. (2003). *Biotechnology of Biofertilizers*. CHIPS, Texas.
17. Academic Press. (2025). *Textbook of Agricultural Microbiology & Phytoremediation*. Academic Press.

SEMESTER-IV

COURSE 10: AGRICULTURAL MICROBIOLOGY

Practical Credits: 1 2 hrs/week

I. Course Outcomes: On successful completion of this practical course, the student shall be able to:

1. Observe and analyze soil properties and microbial diversity.
2. Apply techniques for isolating and characterizing beneficial soil microbes.
3. Identify plant pathogens and examine disease symptoms through microscopic observations and Koch's postulates.

II. Laboratory/Field exercises:

1. Study of soil profile, Texture (sand, silt, clay contents), water holding capacity, and pH.
2. Study and isolate microflora of different types of soils.
3. Isolation of Rhizobium, inoculum preparation, characteristics, and field application.
4. Preparation of Azotobacter inoculant, characteristics, and field application.
5. Isolation of cellulose-degrading organisms /cellulolytic microorganisms
6. Study of important diseases of crop plants by cutting sections of infected plant material (microscopic observations)- Albugo, Puccinia, Ustilago, Fusarium, Colletotrichum.

**4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-IV**

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V