



Sri Venkateswara University, Tirupati

Syllabus for MICROBIOLOGY Major in consonance with Curriculum frame work
w.e.f. AY 2025-26

COURSE STRUCTURE (for Semester I to II)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	
I	I	1	Introduction to Microbiology and Microbial Diversity	3	3	
			Introduction to Microbiology and Microbial Diversity-Practical	2	1	
		2	Principles of Bacteriology and Microbial Techniques	3	3	
			Principles of Bacteriology and Microbial Techniques-Practical	2	1	
	II	3	Fundamentals of Biochemistry and Analytical techniques	3	3	
			Fundamentals of Biochemistry and Analytical techniques-Practical	2	1	
		4	Microbial Physiology	3	3	
			Microbial Physiology-Practical	2	1	
II	III	5	Cell biology and Genetics	3	3	
			Cell biology and Genetics-Practical	2	1	
		6	Molecular biology and bacterial Genetics	3	3	
			Molecular biology and bacterial Genetics-Practical	2	1	
		7	r DNA Technology, Bioinformatics and Biostatistics	3	3	
			r DNA Technology, Bioinformatics and Biostatistics-Practical	2	1	
	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	
	III	V	11	Food Microbiology	3	3
				Food Microbiology-Practical	2	1
Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	
		12 A	Industrial Microbiology	3	3	
			Industrial Microbiology-Practical	2	1	
		OR				
		12 B	Fermentation Technology	3	3	
			Fermentation Technology-Practical	2	1	

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IV	VI	13 A	Environmental microbiology	3	3
			Environmental microbiology-Practical	2	1
		OR			
		13 B	Mushroom Cultivation	3	3
			Mushroom Cultivation-Practical	2	1
		14 A	Clinical microbiology	3	3
			Clinical microbiology-Practical	2	1
		OR			
		14 B	Veterinary microbiology	3	3
			Veterinary microbiology-Practical	2	1
	VII	15 A	QA & QC in Food and Pharmaceutical Industry	3	3
			QA & QC in Food and Pharmaceutical Industry-Practical	2	1
		OR			
		15 B	Microbial Biotechnology	3	3
			Microbial Biotechnology-Practical	2	1
		16	Microbial Biochemistry and Analytical Techniques	3	3
			Microbial Biochemistry and Analytical Techniques-Practical	2	1
		17	Virology	3	3
			Virology-Practical	2	1
		18	Biology of Eukaryotic Microorganisms	3	3
			Biology of Eukaryotic Microorganisms-Practical	2	1
	VIII	19 A	Marine Microbiology	3	3
			Marine Microbiology-Practical	2	1
		OR			
		19 B	Organic Farming	3	3
			Organic Farming-Practical	2	1
		20	Microbial Metabolism	3	3
			Microbial Metabolism-Practical	2	1
		21	Molecular genetics of microorganisms	3	3
			Molecular genetics of microorganisms-Practical	2	1
Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
		22	Immunology	3	3
			Immunology-Practical	2	1
		23 A	Biofertilization Technology	3	3
			Biofertilization Technology-Practical	2	1
		OR			

	23 B	Cellular microbiology	3	3
		Cellular microbiology-Practical	2	1

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the Two specified domains. For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A. To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.



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SEMESTER-I

COURSE 1: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Theory

Credits: 3

3 hrs/week

I. Course Objectives:

1. To understand the historical development of microbiology, major contributions of key scientists, microbial classification systems, and the scope of microbiology.
2. To learn the general characteristics of bacteria, Archaea, Actinomycetes, and Viruses including the replication of Bacteriophage T2 and HIV.
3. To comprehend the general characteristics of microalgae, focusing on key genera like *Chlorella*, *Dunaliella*, and *Spirulina*.
4. To gain knowledge on general characteristics of fungi, with special emphasis on *Saccharomyces* and *Aspergillus*.
5. To understand the general characters and importance of protozoa, with focus on representative genera like *Amoeba* and slime molds.

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

1. Explain the important historical milestones, describe classification systems, differentiate prokaryotic and eukaryotic microorganisms, and list applications of microbiology.
2. Explain the general characters and significance of prokaryotic microorganisms and viruses, and describe the replication mechanisms of Bacteriophage T2 and HIV.
3. Describe the general characters and applications of microalgae and explain their economic importance.
4. Describe morphology of fungi, reproductive mechanisms and explain the economic importance of fungi.
5. Explain the general characters of protozoa and their significance in ecosystems, medicine, and scientific research.

III. Syllabus of Theory:

Unit 1: History and classification of Microbiology

10hrs

- 1.1 Development of microbiology as a discipline, Spontaneous generation vs. biogenesis, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming, Ivanowsky.
- 1.2 Systems of classification: Binomial Nomenclature; Whittaker's five kingdom Classification; Carl Woese's three kingdom classification systems, Concept of Species, Taxa, and Strain;

- 1.3 Brief note on Bergey's Manual of Systematic Bacteriology; Difference between prokaryotic and eukaryotic microorganisms; Definition and scope of Microbiology: Applications of Microbiology.

Unit 2: Prokaryotic microorganisms and Viruses

10hrs

- 2.1 General characteristics of bacteria and archaea: distribution, occurrence, morphology, reproduction and economic importance.
2.2 General characteristics of Viruses with emphasis on discovery of viruses, Nature and definition of viruses, morphology, reproduction and a brief note on Cultivation of Viruses
2.3. General features of Viral Replication; Structure and multiplication of Bacteriophage T2 and HIV

**Unit 3:
Microalgae**

8hrs

- 3.1 General characteristics of algae: occurrence, morphology, habitat, ecological distribution, photosynthetic pigments, food reserves, reproduction and role in aquatic ecosystems
3.2 Morphology, reproduction, ecological significance and applications of a) **Chlorella** (Chlorophyceae) and b) **Spirulina** (Cyanophyceae).
3.3 Economic Importance of Microalgae: Biofertilizers, Biofuels, Pharmaceuticals, Food supplements, Wastewater treatment, Carbon dioxide sequestration, algal polysaccharides.

**Unit 4:
Fungi**

9hrs

- 4.1 Habitat, distribution, nutritional requirements, fungal cell ultra-structure, fungal wall, Outline classification of Fungi
4.2 Important Microfungi: Morphology and structure, reproduction and applications of a) *Saccharomyces* (Ascomycota – Yeast) and b) *Aspergillus* (Ascomycota)
4.3 Economic importance of fungi: in agriculture, food, industry, medicine.

Unit 5: Protozoa

8 hrs

- 5.1 General Characteristics of Protozoa: Morphology, Nutrition, reproduction, Habitat and ecological role
5.2 Important Protozoa: Morphology, locomotion, nutrition, reproduction, Ecological role of a) *Amoeba* and b) Slime Molds
5.3 Economic Importance of Protozoa (in ecosystems, waste management, soil fertility, research and Protozoa as pathogens).


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IV. Reference Books:

1. Alexopoulos, C. J., Mims, C. W., & Blackwell, M. (1996). *Introductory Mycology*. John Wiley, New York.
2. Ali-Shtayeh, M. S., Jamous, R. M., & Yaghmour, R. M.-R. (1998). *Mycology manual*. An-Najah National University.
3. Becker, E. W. (2007). *Microalgae in Biotechnology*. Cambridge University Press.
4. Bessey, E. A. *Morphology and Taxonomy of Fungi*. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Bold, H. C., & Wynne, M. J. (1985). *Introduction to the Algae: Structure and Reproduction* (2nd ed.). Prentice-Hall.
6. Deacon, J. W. (2006). *Fungal Biology* (4th ed.). Blackwell Publishing.
7. Funder, H. F. (1968). *Practical mycology: Manual for identification of fungi*. McGraw- Hill.
8. Garrity, G. M. (Ed.). (2011). *Bergey's Manual of Systematic Bacteriology* (2nd ed.). Springer.
9. Hausmann, K., & Bradbury, P. C. (2002). *Protistology* (2nd ed.). E. Schweizerbart'sche Verlagsbuchhandlung.
10. Jain, A., Agarwal, J., & Venkatesh, V. (2019). *Microbiology practical manual* (1st ed.). Elsevier India.
11. Kumar, H. D., & Singh, H. N. *A Textbook on Algae* (Macmillan International College Edition).
12. Lee, R. E. (2008). *Phycology* (4th ed.). Cambridge University Press.
13. Madigan, M. T., Martinko, J. M., Bender, K., Buckley, D., & Stahl, D. (2021). *Brock Biology of Microorganisms* (16th ed.). Pearson Education.
14. Maheshwari, D. K. (2002). *Practical microbiology*. S. Chand Publishing.
15. Mehrotra, R. S., & Aneja, K. R. *An Introduction to Mycology*. New Age International Press, New Delhi.
16. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (2009). *Microbiology: Concepts and Applications* (6th ed.). McGraw-Hill Education.
17. Prescott, L. M., Harley, J. P., & Klein, D. A. (2005). *Microbiology* (6th ed.). McGraw- Hill Education.
18. Sambamurty, V. S. S. (2010). *A Textbook of Algae*. I.K. International Publishing House Pvt. Ltd.
19. Tortora, G. J., Funke, B. R., & Case, C. L. (2020). *Microbiology: An Introduction* (13th ed.). Pearson Education.
20. Webster, J., & Weber, R. (2007). *Introduction to Fungi* (3rd ed.). Cambridge University Press.

VI. Co- Curricular Activities

1. Arrange guest lectures, to provide insights into the latest advancements and emerging trends in bacteriology and virology.
2. Conduct hands-on microscopy workshops using to observe eukaryotic microorganisms
3. Organize field trips to natural habitats, such as forests, ponds, or marine environments, where eukaryotic microorganisms thrive.
4. Arrange culturing workshops where students can learn how to isolate and culture eukaryotic microorganisms in the laboratory.

SEMESTER-I

COURSE 1: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Practical

Credits: 1

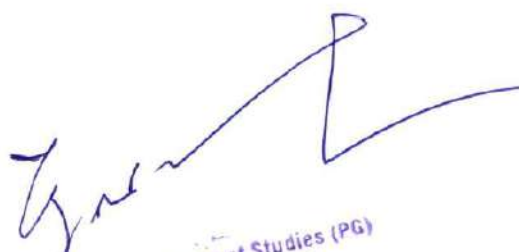
2 hrs/week

I. Course objectives:

1. To learn preparation of culture media and techniques for isolation, identification, and preservation of fungi and algae.
2. To observe vegetative and reproductive structures of key fungal genera through slide preparations.
3. To study host-pathogen interaction and slime mold structures.

II. Laboratory/Field exercises:

1. Study of viruses (Bacteriophage, TMV and HIV) using micrographs
2. Preparation of Potato Dextrose Medium.
3. Isolation and identification of pathogenic and non-pathogenic fungi.
4. Study of host-pathogen interaction.
5. Study of the vegetative and reproductive structures of following genera through temporary and permanent slides: *Mucor*, *Saccharomyces*, *Penicillium*, *Agaricus* and *Alternaria*
6. Purification and preservation of pure cultures of common algae and fungi.
7. Observe prepared slides of slime mold structures.



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4- Year UG Honours, Major
Syllabus
(2025-26)
Semester-I

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