

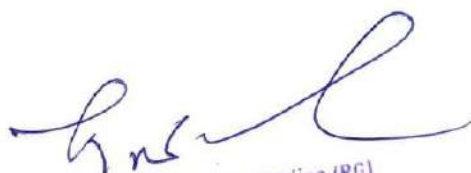


Sri Venkateswara University, Tirupati

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	


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

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.



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

SEMESTER-I

COURSE 2: PRINCIPLES OF BACTERIOLOGY & MICROBIAL TECHNIQUES

Theory	Credits: 3	3 hrs/week
--------	------------	------------

I. Course objectives:

1. To understand the structure and function of prokaryotic cell components and their response to antibiotics.
2. To learn the key characteristics and ecological significance of Photosynthetic bacteria, Gliding bacteria, Mycoplasma, Fermentative bacteria, and Extremophiles.
3. To equip students with an understanding of microscopy principles, techniques, and staining methods used in microbiology.
4. To gain the knowledge of sterilization, disinfection, and various physical and chemical methods for microbial control.
5. To impart practical knowledge of pure culture techniques, maintenance, preservation methods in microbiology.

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

1. Describe bacterial cell structure and explain effects of antibiotics on the cell wall.
2. Identify and describe the important features of Photosynthetic bacteria, Myxobacteria, Mycoplasma, Fermentative bacteria, Methanogens, and Halobacteria.
3. Gain insights into various microscopy techniques and apply simple and differential staining in bacterial observation.
4. Comprehend the principles, methods, and applications of sterilization and disinfection.
5. Comprehend methods for isolating and preserving pure cultures, and techniques for cultivating anaerobic and viable non-culturable bacteria.

III. Syllabus of Theory:

Unit 1 Cell organization

9 hrs

- 1.1 Cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili. Cell wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls.
- 1.2 Cell Membrane: Structure, function and chemical composition of bacterial cell membranes; Differences between eubacteria and archaeobacteria;
- 1.3 Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore; Effect of antibiotics and enzymes on the cell wall: sphaeroplasts, protoplasts, and L-forms.

Unit 2 Type studies of Bacteria and Archaea

9 hrs

- 2.1 Salient features of: a) Photosynthetic bacteria - Purple bacteria, Green bacteria and Anabaena b) Gliding bacteria - Myxobacteria
- 2.2 Salient features of a) Miscellaneous bacteria: Mycoplasma; b) Salient features of Fermentative bacteria
- 2.3 Salient features of Extremophiles- a) Methanogens and Halobacteria.

Unit 3 Basics of Microscopy

9hrs

- 3.1 Light Microscopy: Bright-Field Microscope- Principle, Components, Operation, resolution and Applications; Principle of Dark-field, Phase contrast and fluorescent microscopes.
- 3.2 Electron microscope: Principle, Components, resolution and Applications of Scanning and Transmission Electron Microscopes.
- 3.3 Staining Techniques – Types and properties of dyes; Simple and negative staining; Differential staining techniques- Gram staining, spore staining,

Unit 4 Sterilization and disinfection techniques

9hr

s

- 4.1 Definitions of Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Virucide, Bacteriostatic and Bactericidal agent.
- 4.2 Physical methods of microbial control: Dry heat-Incineration, Hot air oven; Moist heat- Pressure cooker, autoclave; Filter sterilization- laminar air flow, Membrane filter; Radiation methods – UV rays, Gamma rays.
- 4.3 Chemical methods of microbial control: disinfectants, types and mode of action- alcohols, aldehydes, fumigants, phenols, halogens and heavy metals.

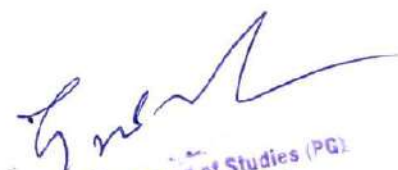
Unit 5 Microbiological techniques

9hrs

- 5.1 Pure culture isolation: Serial dilution, enrichment culturing technique, plating methods, micromanipulator;
- 5.2 Maintenance and preservation/stocking of pure cultures: sub culturing, overlaying cultures with mineral oils, lyophilization, and cultures, storage at low temperature, Culture collection Centers (MTCC, ATCC, DSMZ).
- 5.3 Cultivation of anaerobic bacteria; Accessing Viable non-culturable bacteria (VNBC).

IV. Reference Books:

1. Alcomo, I. E. (2001). *Fundamentals of Microbiology* (6th ed.). Jones and Bartlett Publishers.


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

2. Beckner, W. M., Kleinsmith, L. J., & Hardin, J. (2000). *The World of Cell* (4th ed.). Benjamin/Cummings.
3. Besty, T., & Koegh, D. C. *Microbiology Demystified*. McGraw-Hill.
4. Black, J. G. (2002). *Microbiology – Principles and Explorations*. John Wiley & Sons Inc., New York.
5. Ghatak, K. L. (2011). *Techniques and Methods in Biology*. PHI Publication.
6. Murphy, D. B. (2001). *Fundamentals of Light Microscopy & Electron Imaging* (1st ed.). Wiley-Liss.
7. Pelczar, M., Chan, E. C. S., & Krieg, N. R. *Microbiology*. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
8. Pranav Kumar. (2016). *Fundamentals and Techniques of Biophysics and Molecular Biology*.
9. Prescott, L. M., Harley, J. P., & Klein, D. A. (2002). *Microbiology* (5th ed.). WCB McGraw-Hill, New York.
10. Stainier, R. V., Ingraham, J. L., Wheelis, M. L., & Painter, P. R. *The Microbial World*. Prentice-Hall of India Pvt. Ltd., New Delhi.
11. Tortora, G. J., Funke, B. R., & Case, C. L. (2004). *Microbiology: An Introduction*. Pearson Education, Singapore.

VI. Co-Curricular Activities:

1. Conduct laboratory workshops that allow students to gain hands-on experience in bacterial culture techniques
2. Competition in performing laboratory techniques like staining
3. Artwork with bacteria or fungi in petridish
4. Quiz in identifying microscopic technique in various micrographs

SEMESTER-I

COURSE 2: PRINCIPLES OF BACTERIOLOGY & MICROBIAL TECHNIQUES

Practical

Credits: 1

2 hrs/week

I. Course objectives:

1. To gain practical skills in bacterial isolation, pure culture techniques, and visualization using different microscopy methods.
2. To comprehend and perform basic staining techniques, including Gram, simple, and negative staining, and observe bacterial structures such as motility and capsules.
3. To learn sterilization methods for media and glassware and apply aseptic techniques in microbiological experiments.

II. Laboratory/Field exercises:

1. Isolation of bacteria using Winogradsky column and observation
2. Study of bright field, dark field and phase contrast, Electron microscope micrographs to visualize
3. microbial cells.
4. Simple staining & Negative staining.
5. Gram's staining.
6. Observation of motility and capsule in bacteria
7. Determination of bacterial cell size by the technique Micrometry.
8. Sterilization of medium using Autoclave, Sterilization of glassware using Hot Air Oven.
9. Isolation of pure cultures of bacteria by streaking method.
10. Isolation of bacteria from natural habitat by spread and pour plate method (using serial dilution method)


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

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