

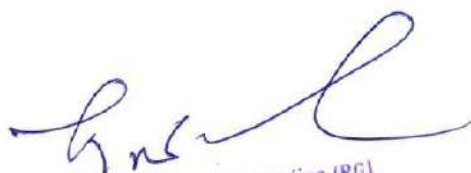


Sri Venkateswara University, Tirupati

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-II

COURSE 4: MICROBIAL PHYSIOLOGY

Theory

Credits: 3

3 hrs/week

I. Course Objectives:

1. To understand the nutritional requirements, transport mechanisms, and growth media used for microbial cultivation.
2. To develop critical understanding of the concept of growth phase, and factors affecting microbial growth, and methods to measure it.
3. To understand the structure, classification, properties, and mechanisms of enzyme action, factors affecting activity and inhibition.
4. To understand the biochemical pathways of microbial respiration and fermentation, energy generation under aerobic and anaerobic conditions.
5. To comprehend the pigments and pathways involved in oxygenic and anoxygenic photosynthesis in bacteria.

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

1. Describe microbial nutritional groups, nutrient uptake mechanisms, and select appropriate growth media for different microorganisms.
2. Explain microbial growth patterns and apply techniques to measure growth.
3. Explain enzyme structure and function, interpret the Michaelis-Menten equation, and differentiate between types of enzyme inhibition.
4. Students will be able to describe glycolysis, TCA cycle, electron transport, and fermentation pathways.
5. Describe bacterial photosynthetic pigments, the photosynthetic machinery, and the differences between oxygenic and anoxygenic photosynthesis.

III. Syllabus of Theory:

UNIT I: Microbial Nutrition

No. of hrs: 9

- 1.1. Nutritional requirements of Microorganisms
- 1.2. Methods of uptake of nutrients by microbial cells- Primary and secondary active transport, concept of uniport, symport and antiport Group translocation; Iron uptake
- 1.3. Nutritional groups of microorganisms-based on C, energy and electron sources: autotrophs, heterotrophs, lithotrophs, organotrophs, Phototrophs, Chemotrophs;
- 1.4. Growth media - synthetic, nonsynthetic, selective, enrichment and differential media.

UNIT II: Microbial Growth**Hrs: 9**

- 2.1. Microbial Growth- Definitions of growth, generation time and specific growth rate; different phases of growth in batch cultures;
- 2.2. Synchronous, continuous, biphasic growth.
- 2.3. Factors influencing microbial growth: Temperature, oxygen concentration, pH, Salt
- 2.4. Methods for measuring microbial growth - Direct microscopy, viable count estimates, turbidometry and biomass.

Unit III Enzymes**Hrs: 9**

- 3.1 Structure of enzyme, Apoenzyme and cofactors, prosthetic group- TPP, coenzyme -NAD, metal cofactors; Definitions of terms: enzyme unit, specific activity and turnover number. Properties of enzymes.
- 3.2 Outline Classification and nomenclature of enzymes, Mechanism of action of enzymes: Lock and key hypothesis, and Induced Fit hypothesis. Michaelis-Menten equation, Factors affecting enzyme activity
- 3.4 Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric inhibition.

UNIT IV: Microbial Respiration and FermentationHrs: 9

- 4.1 Glycolytic Pathways: Glycolysis/EMP pathway and ED; TCA cycle.
- 4.2. Aerobic respiration - ETS and oxidative phosphorylation
- 4.3. Anaerobic respiration, chemoautotrophy - oxidation of inorganic compounds - N and S.
- 4.4. Fermentative modes in microorganisms with special reference to alcoholic, Lactic acid fermentations

UNIT V: Bacterial PhotosynthesisHrs: 9

- 5.1. Photosynthetic pigments, Photosynthetic apparatus in prokaryotes
- 5.2. Outlines of oxygenic photosynthesis in bacteria
- 5.3. Outlines of anoxygenic photosynthesis in bacteria

IV. Reference Books:

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company
2. Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications, Iowa, USA.
3. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.
4. Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A student Companion. I.K. International Pvt. Ltd.

5. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H. Freeman
6. Voet, D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
7. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.

VI. Co-Curricular Activities:

1. Assignments in nutrient utilization, energy production, metabolic pathways,
2. Students can study microbial growth curves, metabolic pathways, or physiological responses to environmental factors.
3. Organize seminars where students can deliver presentations on specific topics in microbial physiology and metabolism.
4. Create visual representations of microbial metabolic pathways.
5. Extract and analyse bacterial photosynthetic pigments using paper chromatography to visualize pigment composition and understand functional roles.

SEMESTER-II

COURSE 4: MICROBIAL PHYSIOLOGY

Practical

Credits: 1

2 hrs/week

I. Course Objectives:

1. To cultivate phototrophic bacteria by enrichment and observe their morphology and pigmentation.
2. To study *E. coli* growth under different temperature, pH, and salt conditions, and plot its growth curve.
3. To identify cyanobacteria from permanent slides and understand their ecological role.

II. Laboratory/Field exercises:

1. Cultivation of phototrophic bacteria by enrichment method.
2. Effect of Temperature on *E. Coli* growth
3. Effect of pH on bacterial *E. Coli* growth
4. Effect of salt on growth of *E. coli* growth
5. Study and plot the growth curve of *E. coli* by turbid metric and standard plate count methods
6. Observation and identification of permanent slides of cyanobacteria


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

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