



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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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
		OR			
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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TIRUPATI-517 502 A.P.

SEMESTER-II

COURSE 3: FUNDAMENTALS OF BIOCHEMISTRY AND ANALYTICAL TECHNIQUES

Theory	Credits: 3	3 hrs/week
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I. Course Objectives:

1. To comprehend the classification, structure, and properties of carbohydrates, including mono-, di-, and polysaccharides.
2. To gain knowledge about the structure, classification, and biological significance of lipids and fatty acids.
3. To understand the structure, classification, and functional roles of amino acids and proteins.
4. To understand the structure, function of nucleic acids, and to understand the role of vitamins in metabolism.
5. To understand the principles, instrumentation, and applications of key analytical techniques in biochemistry.

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

1. Describe the structure, stereochemistry, and functional significance of different carbohydrates.
2. Understand the structure, types, and functions of lipids, fatty acids, triglycerides, phospholipids, steroids, and waxes.
3. Explain amino acid types, protein structures, and the impact of denaturation on protein function.
4. Describe DNA and RNA structures, base composition, stabilizing forces, and explain the types and metabolic significance of vitamins.
5. Apply spectroscopy, chromatography, centrifugation, and electrophoresis methods to analyze biomolecules

III. Syllabus of Theory:

UNIT-1: Carbohydrates

Hrs: 9

- 1.1 General characters and outline classification of Carbohydrates.
- 1.2 Monosaccharides- Glucose, fructose, ribose; Stereo- isomerism of monosaccharides, epimers, mutarotation and anomers of glucose;
- 1.3 Disaccharides- concept of reducing and non-reducing sugars; Sucrose, Lactose, Maltose
- 1.4 Polysaccharides: Storage- Starch, glycogen; Structural- Cellulose, peptidoglycan and chitin

UNIT-2: Lipids and fatty acids

hrs: 9

- 2.1 Definition and classification of lipids. Structure and properties of lipids. Importance of Lipids in biological systems.
- 2.2 Introduction to fatty acids: definition, structure, and nomenclature. Saturated and unsaturated fatty acids.
- 2.3 Triglycerides: structure and function
- 2.4 Phospholipids: structure, function, and role in cell membranes. Steroids: structure and physiological roles. Waxes: structure, functions, and applications.

UNIT-3: Amino acids and Proteins.

Hrs 9

- 3.1 Amino acids –classification, structure and function.
- 3.2 General characteristics of amino acids and proteins. Denaturation of proteins.
- 3.3 Primary, secondary, tertiary and quaternary structures of Protein

UNIT-4: Nucleic acids and Vitamins

Hrs 9

- 4.1 Structure and functions of DNA and RNA. Types of DNA and RNA.
- 4.2 Base composition. A+T and G+C rich genomes. Basic concept of nucleic acids protein interactions. Chargaff's rule. Forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking).
- 4.3 Concept and types of vitamins and their role in metabolism.

Unit 5 Analytical Techniques

Hrs 9

- 5.1 Spectroscopy – Principle, Beer-Lambert law, Instrumentation and applications of UV- visible spectrophotometer. Colorimetry and turbidometry.
- 5.2 Chromatography: Principles and applications of paper and Column chromatography
- 5.3 Centrifugation- Principle of centrifugation; Types of centrifuges: Low- speed, High- speed, and Ultracentrifuge – and their applications.
- 5.4 Electrophoretic technique: Agarose gel electrophoresis-Components, working principle and applications.

IV. Reference Books:

- 1. Aurora Blair. *Laboratory Techniques & Experiments in Biology*. Intelliz Press.
- 2. Berg, J. M., Tymoczko, J. L., & Stryer, L. (2011). *Biochemistry*. W. H. Freeman and Company.
- 3. Caldwell, D. R. (1995). *Microbial Physiology and Metabolism*. W. C. Brown Publications, Iowa, USA.
- 4. Ghatak, K. L. (2011). *Techniques and Methods in Biology*. PHI Publication.

5. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (1993). *Principles of Biochemistry* (2nd ed.). CBS Publishers and Distributors, New Delhi.
6. Plummer, D. T. (1987). *An Introduction to Practical Biochemistry*. McGraw Hill Publication.
7. Pranav Kumar. (2016). *Fundamentals and Techniques of Biophysics and Molecular Biology*.
8. Rao, B. S., & Deshpande, V. (2007). *Experimental Biochemistry: A Student Companion*. I.K. International Pvt. Ltd.
9. Tymoczko, J. L., Berg, J. M., & Stryer, L. (2012). *Biochemistry: A Short Course* (2nd ed.). W. H. Freeman.
10. Voet, D., & Voet, J. G. (2004). *Biochemistry* (3rd ed.). John Wiley and Sons.
11. White, D. (1995). *The Physiology and Biochemistry of Prokaryotes*. Oxford University Press, New York.
12. Wilson, K., & Walker, J. (2000). *Principles and Techniques in Practical Biochemistry* (5th ed.). Cambridge University Press.

VI. Co-Curricular Activities:

1. Test various food samples for the presence of mono-, di-, and polysaccharides using simple chemical tests. Results can be presented as a poster or infographic explaining the type and significance of carbohydrates in different foods.
2. Organize Biomolecule Modeling Workshops where students can learn to build physical models or use computer simulations to visualize biomolecules such as proteins, nucleic acids, carbohydrates, and lipids.
3. Test knowledge of principles, applications, and troubleshooting of analytical methods by conducting a quiz.

SEMESTER-II

COURSE 3: FUNDAMENTALS OF BIOCHEMISTRY AND ANALYTICAL TECHNIQUES

Practical

Credits: 1

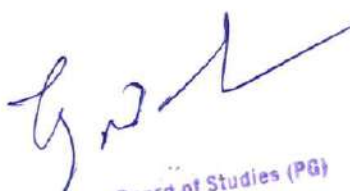
2 hrs/week

I. Course Objectives:

1. To gain practical skills in qualitative and quantitative analysis of sugars, amino acids, proteins, and DNA.
2. To understand and apply chromatographic techniques for the separation of biomolecules.
3. To learn centrifugation and electrophoresis methods for isolating and analyzing cellular and molecular components.

II. Laboratory/Field exercises:

1. Qualitative tests for sugars
2. Qualitative Analysis of Aminoacids.
3. Colorimetric estimation DNA by diphenylamine method.
4. Colorimetric estimation of proteins by Biuret/Lowry method
5. Separation of monosaccharides/amino acids by paper chromatography.
6. Separation of bacterial cells (cell pellet) from broth culture by using a laboratory scale centrifuge.
7. Separation of DNA fragments by Agarose gel electrophoresis.


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MICROBIOLOGY
S. V. UNIVERSITY
TIRUPATI-517 502 A.P.

**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