



**Vitthalbhai Patel & Rajratna P. T. Patel Science College**  
**(Autonomous)**  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.13))  
Affiliated to SARDAR PATEL UNIVERSITY  
Vallabh Vidyanagar, Gujarat  
Syllabus effective from the Academic Year 2024-2025



(Bachelor of Science) (Undergraduate)  
B. Sc. (UG) Semester-II

Course Code	<b>US02MAMI01</b>	Title of the Course	<b>FUNDAMENTALS OF MICROBIOLOGY</b>
Total Credits of the Course	04	Hours per Week	04
Course Objectives:	To make the students familiar with: <ul style="list-style-type: none"><li>• Major characteristics of microorganisms.</li><li>• Introduction to concepts of biochemistry for a microbiologist</li><li>• Basic knowledge of bio molecules and enzymes</li><li>• The nutritional requirements and physical parameters needed for the cultivation of bacteria.</li><li>• Knowledge of culture media and nutritional classification of bacteria</li></ul>		

Course Content		
Unit	Description	Weightage* (%)
1.	<b>Introduction to bio molecules and enzymes</b>  a) <b>Introduction to Biomolecules:</b> i) Structure and chemistry of nucleic acids and biological significance of nucleic acids ii) Structure and chemistry of carbohydrates (properties, types and biological significance) iii) Lipids: properties and biological significance iv) Structure( primary, secondary, tertiary and quaternary) and chemistry of Proteins and their biological significance  b) <b>Introduction to Enzymes:</b> i) Characteristics, chemical and physical properties of enzymes ii) Nomenclature and classes of enzymes iii) Mode of action of enzymes iv) factors affecting enzyme activity.	25%



2.	<p><b>The Characterization, Classification, and Identification of Microorganisms</b></p> <p>a) Introduction to taxonomy</p> <ul style="list-style-type: none"><li>Major Characteristics of Microorganisms: Morphological Characteristics, Chemical Characteristics, Cultural Characteristics, Metabolic Characteristics, Antigenic Characteristics, Genetic Characteristics, Pathogenicity, Ecological Characteristics</li></ul> <p>b) Classification</p> <ul style="list-style-type: none"><li>Taxonomic hierarchy</li><li>Goals of classification</li><li>General methods of classifying bacteria<ul style="list-style-type: none"><li>➤ Intuitive</li><li>➤ Numerical taxonomy</li><li>➤ Genetic relatedness</li><li>➤ Mol% G+C values</li><li>➤ DNA homology experiments</li><li>➤ rRNA homology experiments</li><li>➤ rRNA oligonucleotide cataloguing</li></ul></li></ul>	25%
3.	<p><b>Cultivation of Bacteria:</b></p> <p>a) Nutritional Requirements,</p> <p>b) Nutritional Types of Bacteria: Phototrophs, Chemotrophs, Autotrophs and Heterotrophs and Obligate Parasites</p> <p>c) Bacteriological Media, Types of Media, Preparation of Media.</p> <p>d) Physical Conditions Required for Growth : Temperature, Gaseous Requirements, Acidity or Alkalinity (pH), Miscellaneous Physical Requirements, Choice of Media and Conditions of Incubation</p>	25%
4.	<p>Pure culture techniques</p> <p>i) Definition: pure culture (axenic culture) Natural microbial population(mixed culture)</p> <p>ii) Selective methods – physical, chemical, biological)</p> <p>iii) Selection in nature</p> <p>iv) Methods of isolating pure culture-</p> <ul style="list-style-type: none"><li>aseptic technique</li><li>streak plate technique</li></ul>	25%

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	<ul style="list-style-type: none"> <li>• spread plate technique</li> <li>• use of serial dilution</li> <li>• pour plate method</li> <li>• micromanipulator</li> </ul> <p>v) Cultural characteristics of pure culture on solid media and in broth culture</p> <p>vi) Preservation and maintenance of pure culture .</p> <p>vii) Culture collection centres</p>	
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Teaching-Learning Methodology	<ul style="list-style-type: none"> <li>• The major teaching- learning consists of lectures and discussions (large group) in which the teacher makes a use of chalk and talk as well as power point presentation to introduce the learning objectives related to the basic concepts of the subject.</li> <li>• These sessions incorporate space for participation and involvement of students through questions.</li> </ul>
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**Evaluation Pattern**

Sr. No.	Details of the Evaluation	Weightage
1.	Internal continuous assessment in the form of class test/internal written test – 15 marks(30%), quiz -15 marks (30%) active learning 05 marks(10%) home assignment – 05 marks(10%), class assignment -05 marks (10%) , attendance- 05 marks (10%)( As per SPU Letter No. E-3/2748 dated 02/02.2024 & As per CBCS R.6.8.3) Total 50 marks (50%)	50%
2.	External University Examination	50%

**Course Outcomes:**

1.	Can comment and explain regarding various biomolecules and their significance.
2.	Use the knowledge of nutritional requirements and various conditions for cultivation and isolation of bacteria at laboratory level as an applied aspect ,



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3.	Describe the concepts of classification , identification of bacteria and isolation of pure culture
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Suggested Reference Books:

Sr. No.	Reference Books
1.	Microbiology - Michael J. Pelczar JR.; E.C.S.Chan; Noel R. Krieg. Fifth edition
2.	Elementary Microbiology Vol : I – Dr. H.A. Modi
3	“Microbiology” Prescott L, Harley J P, and Klein D A, 6th edition. WmC.Brown - McGraw Hill, Dubuque, IA Ltd.
4	Microbiology- R.M.Atlas

On-line resources

On-line Resources : : INFLIBNET, Google Web Google books,

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B.Sc. (Microbiology) Semester II Practicals

Course Code	US02MAMI02	Title of the Course	Practicals: Based on Fundamentals of Microbiology
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	<p>To demonstrate:</p> <ul style="list-style-type: none"><li>• Understanding of various laboratory equipments and use of pH meter.</li><li>• Preparation of nutritional media</li><li>• The use of requirements and various conditions for cultivation and isolation of bacteria as an applied aspects</li></ul>
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Course Content		
No.	Practicals Based on :Fundamentals of Microbiology	Weight age* (%)
	<b>SECTION-1</b>	
1.	Demonstration of adjustment of pH of media by use of pH strips and pH meter.	
2	Preparation of buffer: Phosphate buffer	
3.	Preparation of routine media: Nutrient broth and Nutrient agar	
4.	Qualitative analysis of Carbohydrates.	
5.	Qualitative analysis of Proteins	
6	Disposal of media	
	<b>SECTION-2</b>	
7.	Study of differential and selective media: EMB and Macconkey's Agar.	

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8	Study of enzyme production by bacteria like amylase, caseinase, gelatinase, catalase on media containing their specific substrate.	
9	Demonstration: Measurement of microscopic objects using stage and ocular micrometer.	
10	Isolation, cultivation and preservation of bacteria in pure culture by: (i) Streak plate (ii) Spread plate method.	
11	Enumeration of bacteria using pour plate method	
12	Study of Various growth types of bacteria by inoculating liquid media( nutrient broth	
13	Study of pigment medium N-broth production by bacteria	
14	Cultivation of anaerobic bacteria.	

Teaching-Learning Methodology	<ul style="list-style-type: none"><li>• By briefing them with the theoretical aspects as well as providing them with the protocol (Aim, Requirements and Procedure) of the experiment to be performed using chalk and duster as well as power point presentation.</li><li>• Students are trained for microscope observations and its handling.</li><li>• Demonstrations of the practical are also carried out and care is taken for aseptic handling and skill development for microbiological work in the laboratory.</li><li>• Possibility of various results and their interpretation is also discussed.</li></ul>
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weight age
	During practical examination; student should have a certified journal	



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	duly signed by head of department and the teacher in charge at the time of examination.	
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Course Outcomes: Having completed this course, the learner will be able to:

1.	Use common laboratory equipments.
2.	Become proficient at safety procedures and microbial handling techniques.
3.	Acquire requisite laboratory skills in media preparations.
4.	Comprehend the basic fundamental knowledge of how microorganisms grow on growth media
5.	Learns various biochemical properties of bio molecules.

Suggested References:

Sr. No.	References
1.	Experimental Microbiology - RakeshJ.Patel & Kiran R. Patel, Volume I
2.	Practical Microbiology- Dr. R.C. Dubey and Dr. D.K. Maheshwari ( Revised edition), S. Chand publication
3.	Microbiology : A Practical Approach – Dr Bhavesh Patel and Dr NandiniPhanse

On-line resources to be used if available as reference material

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