

**SARDAR PATEL UNIVERSITY**  
**B.Sc. Microbiology Semester I**  
**(Major subject)**

Course Code	US01MAMIC01	Title of the Course	Introduction to Microbiology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	<p>To make the students familiar with:</p> <ul style="list-style-type: none"> <li>• Microbiology as a subject of biological sciences</li> <li>• Historical development and Scope of Microbiology</li> <li>• Techniques to study microbiology like staining techniques</li> <li>• Understanding of various types of microscopes <ul style="list-style-type: none"> <li>• Classification, characterization and identification of microorganisms. General characteristics and significance of eukaryotic microbes: fungi, algae, protozoa, lichens</li> </ul> </li> </ul>
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Course Content		
Unit	Description:	weightage%
1.	<p><b>The Scope of Microbiology</b></p> <p>a) Microbiology as a field of Biology</p> <p>b) Place of microorganisms in the living world: Haeckel's Kingdom Protista, Procaryotic and Eucaryotic Protists , Whittaker's Five-Kingdom Concept , Kingdom Procaryotae after Bergey's Manual of Systematic Bacteriology</p> <p>c) Groups of Microorganisms</p> <p>d) Distribution of Microorganisms in Nature</p> <p>e) Applied Areas of Microbiology</p> <p>f) Microbiology and the Origin of Life</p>	
2	<p><b>History of Microbiology:</b></p> <p>a) Discovery of Microorganisms</p> <p>b) Spontaneous generation versus Biogenesis</p> <p>c) Germ theory of Fermentation</p> <p>d) Germ theory of disease</p> <p>e) Laboratory techniques and pure cultures</p> <p>f) Principles of Immunization</p> <p>g) Widening horizons:</p> <p style="margin-left: 20px;">i. Medical microbiology</p> <p style="margin-left: 20px;">ii. Agricultural and Industrial microbiology</p> <p style="margin-left: 20px;">iii. Molecular biology</p> <p style="margin-left: 20px;">iv. Microbiology and Society</p>	25



3.	<p><b>Techniques to study Microbiology:</b></p> <p>(A) Stains and Staining:</p> <ol style="list-style-type: none"> <li>i. Dyes and stains: Definition and examples : acidic dyes, basic dyes and leuco compounds.</li> <li>ii. Principles of staining technique in Bacteria</li> <li>iii. Steps in staining process</li> <li>iv. Role of intensifier, mordents and decolorizers</li> <li>v. Types of staining: Simple staining, Negative staining, Differential staining : Gram staining</li> <li>vi. The wet-mount and hanging-drop techniques</li> </ol> <p>(B) Microscopy:</p> <ol style="list-style-type: none"> <li>i. Microscopes and microscopy: Bright field Microscopy, Resolving power, Numerical Aperture, Limit of Resolution, Magnification, Dark field Microscopy.</li> <li>ii. Principles and applications of fluorescent and phase contrast Microscopy.</li> </ol> <p>Electron microscopy: Transmission Electron Microscopy, Scanning Electron Microscopy, Limitations of Electron Microscopy</p>	25%
4.	<p><b>Prokaryotic cell organization:</b></p> <ol style="list-style-type: none"> <li>a) Morphology of bacteria</li> <li>b) Basic structure of Bacterial cell</li> <li>c) Structures external to the cell: <ol style="list-style-type: none"> <li>i. Flagella (Structure and function), Pili, Capsules, Sheaths, Prosthecae and stalks</li> <li>ii. Cell wall structure and chemical composition.</li> </ol> </li> <li>d) Structures internal to the cell wall: <ol style="list-style-type: none"> <li>i. Cytoplasmic membrane</li> <li>ii. Protoplasts and spheroplasts</li> <li>iii. Membranous intrusions and Intracellular membrane systems.</li> <li>iv. The cytoplasm</li> <li>v. Cytoplasmic inclusions and vacuoles</li> <li>vi. Nuclear material</li> </ol> </li> <li>e) Introduction to Spores and Cyst.</li> </ol>	

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 Written / Practical Examination.	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Understand the scope and History of Microbiology.
2.	Use the knowledge of staining techniques and microscopes in microscopic examination
3.	Understands different groups of microorganisms

Suggested References:	
Sr. No.	References:
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.

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

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SARDAR PATEL UNIVERSITY  
(Bachelor of Science) (Microbiology)  
**(B. Sc.) (Microbiology) Semester- I Practicals**

Course Code	US01MAMIC02	Title of the Course	Microbiology Practicals: Based on Introduction to Microbiology
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	To demonstrate: <ul style="list-style-type: none"> <li>• Understanding of various laboratory equipment and use of microscope.</li> <li>• Microbial handling techniques and disposal of laboratory waste.</li> <li>• Basic skills like preparation of smear, culture media &amp; reagents as well as illustrating staining techniques to visualize bacterial cell and their external and internal structures.</li> </ul>
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Course Content:		
Sr. No.	Practicals: Based on theory course : Introduction to Microbiology	Weightage (%)
	<b>SECTION-1</b>	
1.	Introduction to Laboratory Apparatus and Instruments.	100 %
2.	Cleaning and Preparation of Glassware for Sterilization.	
3.	Preparation of Reagents – Preparation of Normal, Molar and percent ( %) Solution of HCl and NaOH.	
4	Preparation of reagents and stains for Gram staining.	
5	Demonstrations for aseptic handling during microbiological work, preparation of smear, use of oil immersion lens of microscope, making stained slides permanent for future use.	
6.	Monochrome staining using basic dye: Positive staining	
7	Monochrome staining using acidic dye: Negative staining	
8	Gram staining as a differential staining technique.	
	<b>SECTION-2</b>	
9	Study of motility by hanging drop preparation	
10	Cell wall staining by Dyar's/ Ringer's method	
11	Capsule staining of bacteria by Hiss/Maneval's method.	



12	Endospore staining by Dorner's / Snyder's method	
13	Metachromatic granule staining by Albert's method	
14	Spirochete staining by Fontana's method	
15	Study of omnivorous presence of microorganisms in different habitat – environment : Air, Water, Soil, Food, Milk, Curd, Skin, Surface of table	

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 microscopic 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:	Weightage %
1.	During practical examination; student should have a certified journal duly signed by head of department and the teacher in charge at the time of examination.	

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Get acquainted with the use of microscope for viewing stained specimen.
2.	Use common laboratory equipments.
3.	Become proficient at safety procedures & microbial handling techniques.
4.	Acquire requisite laboratory skills in preparing stained smear and identify the morphology and arrangement of bacteria.



Suggested References:

Sr. No.	References:
1.	Experimental Microbiology - Rakesh J. 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 Nandini Phanse

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



SARDAR PATEL UNIVERSITY  
(Bachelor of Science) (Microbiology)  
**(B. Sc.) (Microbiology) Semester- I**

Course Code	US01MIMIC01	Title of the Course	Introduction to Microbiology
Total Credits of the Course	2	Hours per Week	2

Course Content		
Unit	Description:	weightage%
1.	<p><b>History and development of Microbiology:</b></p> <ul style="list-style-type: none"> <li>i. Discovery of Microorganisms</li> <li>ii. Spontaneous generation versus Biogenesis</li> <li>iii. Germ theory of Fermentation</li> <li>iv. Germ theory of disease</li> <li>v. Principles of Immunization</li> <li>vi. Distribution of Microorganisms in Nature</li> <li>vii. Groups of Microorganisms</li> <li>vii Applied areas of Microbiology</li> </ul>	50%
2.	<p><b>Stains and staining Techniques to study Microbiology:</b></p> <p>(A) Stains and Staining:</p> <ul style="list-style-type: none"> <li>vii. Dyes and stains: Definition and examples : acidic dyes, basic dyes and leuco compounds.</li> <li>viii. Principles of staining technique in Bacteria</li> <li>ix. Steps in staining process</li> <li>x. Role of intensifier, mordents and decolourisers</li> <li>xi. Types of staining: Simple staining, Negative staining, Differential staining : Gram staining</li> </ul> <p>(B) Microscopy: Introduction to Light and electron microscope</p>	50%

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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Course Objectives:	To make the students familiar with: <ul style="list-style-type: none"> <li>• Microbiology as a subject of biological sciences</li> <li>• Historical development and Scope of Microbiology</li> <li>• Techniques to study microbiology like staining techniques</li> <li>• Understanding of various types of microscopes</li> </ul>
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination.	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Understand the scope and History of Microbiology.
2.	Use the knowledge of staining techniques and microscopes in microscopic examination

Suggested References:	
Sr. No.	References:
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.

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SARDAR PATEL UNIVERSITY  
(Bachelor of Science) (Microbiology)  
(B. Sc.) (Microbiology) Semester- I Practicals for Minor

Course Code	US01MIMIC02	Title of the Course	Microbiology Practicals: Based on Introduction to Microbiology
Total Credits of the Course	2	Hours per Week	4
Course Objectives:	<p>To demonstrate:</p> <ul style="list-style-type: none"> <li>• Understanding of various laboratory equipment and use of microscope.</li> <li>• Microbial handling techniques and disposal of laboratory waste.</li> <li>• Basic skills like preparation of smear, culture media &amp; reagents as well as illustrating staining techniques to visualize bacterial cell and their external and internal structures.</li> </ul>		

Course Content:		
Sr. No.	Practicals: Based on theory course : Introduction to Microbiology	Weightage (%)
1.	Introduction to Laboratory Apparatus and Instruments.	100 %
2.	Cleaning and Preparation of Glassware for Sterilization.	
3.	Preparation of Reagents – Preparation of Normal, Molar and percent (%) Solution of HCl and NaOH.	
4.	Preparation of reagents and stains for Gram staining.	
5.	Demonstrations for aseptic handling during microbiological work, preparation of smear, use of oil immersion lens of microscope, making stained slides permanent for future use.	
6.	Monochrome staining using basic dye: Positive staining	
7.	Monochrome staining using acidic dye: Negative staining	
8.	Gram staining as a differential staining technique.	

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 microscopic 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:	Weightage %
.	During practical examination; student should have a certified journal duly signed by head of department and the teacher in charge at the time of examination.	

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Get acquainted with the use of microscope for viewing stained specimen.
2.	Use common laboratory equipments.
3.	Become proficient at safety procedures & microbial handling techniques.
4.	Acquire requisite laboratory skills in preparing stained smear and identify the morphology and arrangement of bacteria.

Suggested References:	
Sr. No.	References:
1.	Experimental Microbiology - Rakesh J. 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 Nandini Phanse

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



**SARDARPATELUNIVERSITY**  
**Syllabus Structure B.Sc. Semester: I**  
**With Effect From: June – 2023**  
**Bachelor of Science**  
**B.Sc. Microbiology Semester I**  
**(Inter disciplinary)**

Course Code	US01IDMIC01	Title of the Course	Introduction to Microbiology
Total Credits of the Course	2	Hours per Week	2

Course Content		
Unit	Description:	weightage%
1.	<b>Microorganisms:</b> <ol style="list-style-type: none"> <li>i. Discovery of Microorganisms</li> <li>ii. Distribution of Microorganisms in Nature</li> <li>iii. Groups of Microorganisms</li> <li>iv. Applied areas of Microbiology</li> </ol>	50%
2.	<b>Stains and staining Techniques to study Microbiology:</b> <b>(A) Stains and Staining:</b> <ol style="list-style-type: none"> <li>i. Dyes and stains: Definition and examples : acidic dyes, basic dyes and leuco compounds.</li> <li>ii. Steps in staining process</li> <li>iii. Types of staining: Simple staining, Negative staining, Differential staining : Gram staining</li> </ol> <b>(B) Microscopy:</b> Introduction to Light and electron microscope	50%

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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Course Objectives:	To make the students familiar with: <ul style="list-style-type: none"> <li>• Microbiology as a subject of biological sciences</li> <li>• Historical development and Scope of Microbiology</li> <li>• Techniques to study microbiology like staining techniques</li> <li>• Use of microscope.</li> </ul>
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination.	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Understand the scope and History of Microbiology.
2.	Use the knowledge of staining techniques and microscopes in microscopic examination

Suggested References:	
Sr. No.	References:
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.

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

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SARDAR PATEL UNIVERSITY  
(Bachelor of Science) (Microbiology)  
(B. Sc.) (Microbiology) Semester- I Practicals for ID

Course Code	US01IDMIC02	Title of the Course	Microbiology Practical
Total Credits of the Course	2	Hours per Week	4
Course Objectives:	To demonstrate: <ul style="list-style-type: none"> <li>• Understanding of various laboratory equipment and use of microscope.</li> <li>• Microbial handling techniques and disposal of laboratory waste.</li> <li>• Basic skills like preparation of smear, culture media &amp; reagents as well as illustrating staining techniques to visualize bacterial cell using light microscope.</li> </ul>		

Course Content:		
Sr. No.	Practicals: Based on theory course : Introduction to Microbiology	Weightage (%)
1.	Introduction to Laboratory Apparatus and Instruments.	100 %
2.	Cleaning and Preparation of Glassware for Sterilization.	
3.	Preparation of Reagents – Preparation of Normal, Molar and percent ( %) Solution of HCl and NaOH.	
4.	Preparation of reagents and stains for Gram staining.	
5.	Demonstrations for aseptic handling during microbiological work, preparation of smear, use of oil immersion lens of microscope, making stained slides permanent for future use.	
6.	Monochrome staining using basic dye: Positive staining	
7.	Monochrome staining using acidic dye: Negative staining	
8.	Gram staining as a differential staining technique.	

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 microscopic 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:	Weightage %
.	During practical examination; student should have a certified journal duly signed by head of department and the teacher in charge at the time of examination.	

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Get acquainted with the use of microscope for viewing stained specimen.
2.	Use common laboratory equipments.
3.	Become proficient at safety procedures & microbial handling techniques.

Suggested References:	
Sr. No.	References:
1.	Experimental Microbiology - Rakesh J. Patel & Kiran R. Patel, Volume-I
2.	Practical Microbiology- Dr. R.C. Dubey and Dr. D.K. Maheshwari (Revised edition), S. Chand publication

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



SARDAR PATEL UNIVERSITY  
Syllabus Structure B.Sc. Semester: I  
With Effect from: June – 2023  
Bachelor of Science  
Skill Enhancement course

Course Code	US01SEMIC01	Title of the Course	Fermented food
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make the students familiar with: <ul style="list-style-type: none"> <li>• Food fermentation as a subject of biological sciences</li> <li>• Food spoilage and fermentation biochemistry</li> <li>• Benefits of fermented foods and their production, introduction to probiotics, prebiotics and synbiotics.</li> </ul>
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Course Content		
Unit	Description:	weightage%
1.	<p><b>Food and microbes:</b></p> <ul style="list-style-type: none"> <li>iv. Basic components of the food. Hands on detection tests.</li> <li>v. How do microbes enter our food? Hands on understanding of food contamination and spoilage. Concept of starter culture.</li> <li>vi. Food spoilage, factors affecting it and consequences</li> <li>vii. Fermentation of food and factors affecting</li> <li>viii. Benefits of food fermentation. Probiotics, prebiotics and synbiotics. Study of probiotic food products: hands on activity.</li> <li>ix. Microbes as food. Hands on study of mushrooms, Spirullina and activation of dry yeast.</li> </ul>	50%
2.	<p>Understanding the production of fermented food:</p> <p>(A) Fermented dairy products :</p> <ul style="list-style-type: none"> <li>iv. Biochemistry of milk fermentation.</li> <li>v. Sour curdling: hands on activity.</li> <li>vi. Fermented dairy products: hands on activity.</li> </ul> <p>(B) Fermented food products:</p> <ul style="list-style-type: none"> <li>iii. Biochemistry of food fermentation.</li> <li>iv. Indian fermented food: hands on study of a wide range of food the students eat.</li> <li>v. An overview of international fermented food.</li> <li>vi. Examples of fermented dairy products. Visit to a dairy. Sweet curdling and cheese making. Hands on study: types of cheese.</li> </ul>	50%



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 Written / Practical Examination.	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Understand the scope and History of Microbiology.
2.	Describe the ultra-structure of a bacterial cell.
3.	Use the knowledge of staining techniques and microscopes in microscopic examination

Suggested References:	
Sr. No.	References:
1.	Microbiology - Michael J. Pelczar JR.; E.C.S.Chan; Noel R. Krieg. Fifth edition
2.	Fermented food – Dr. H.A. Modi
3.	“Microbiology” Prescott L, Harley J P, and Klein D A, 6th edition. WmC.Brown - McGraw Hill, Dubuque, IA Ltd.

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