

SARDARPATELUNIVERSITY
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Major subject)

Course Code	US03MAMIC01	Title of the Course	INTRODUCTION TO MICROBIAL PHYSIOLOGY
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"> • Introduction to concepts of growth of prokaryotes for a microbiologist • Nutrient uptake and transport • Methods of reproduction in prokaryotes and concepts of bacterial growth of different types. • Control of microorganisms both by physical and chemical agents. • Concepts of chemotherapy
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Course Content

Unit	Description:	weightage%
1.	<p>CONCEPTS OF GROWTH: I</p> <p>A. Basic concepts</p> <p>a) Nutrient Uptake and transport</p> <p>b). Modes of reproduction(cell division) in bacteria</p> <p>B. Growth in prokaryotes:</p> <p>a) Introduction</p> <p>b) Mathematical nature and expression of growth</p> <p>c) Normal growth curve of microbial population in batch culture system: lag phase,exponential phase, stationary phase, death phase, and transitional periods between growth phases.</p>	
2	<p>CONCEPTS OF GROWTH:II</p> <p>a)Diauxic growth,</p> <p>b) continuous culture,</p> <p>c)Synchronous growth</p> <p>d)Measurement of Bacterial Growth :</p> <p>Direct Microscopic Count • Electronic Enumeration of Cell Numbers • The Plate Count Method • Membrane-Filter Count • Turbidimetric Methods • Determination of Nitrogen Content • Determination of the Dry Weight of Cells • Measurement of a Specific Chemical Change Produced on a Constituent of the Medium • The Relation of Turbidity Measurements to Direct Expressions of Growth</p> <p>e) Factors affecting growth of bacteria: Temperature, gaseous requirements, oxygen toxicity, pH and miscellaneous physical requirements.</p>	25



3.	<p>CONTROL OF MICROORGANISMS BY PHYSICAL AGENTS</p> <p>A. Fundamentals of control</p> <p>a) Definition of terms: Sterilization, Germicide, Microbicide, Bacteriocide and Bacteriostasis</p> <p>b) The Rate of Death of Bacteria</p> <p>c) Condition influencing antimicrobial action</p> <p>d) Mode of action of antimicrobial agents.</p> <p>B. Physical agents</p> <p>a) High temperature</p> <p>b) Low temperature</p> <p>c) Desiccation</p> <p>d) Osmotic pressure</p> <p>e) Radiation</p> <p>f) Surface Tension and Interfacialtension</p> <p>g) Filtration</p>	25%
4.	<p>Control of Microorganism by Chemical agents</p> <p>A. Chemical agents</p> <p>a) Definition of terms: Sterilization, disinfectant, Antiseptic, Antimicrobial agent</p> <p>b) Characteristics of an ideal antimicrobial chemical agents</p> <p>c) Selection of chemical agent</p> <p>d) Major groups of chemical Antimicrobial agents:Examples, list of applications and mode of actions of:Phenol and phenolic compounds Alcohols Halogens Heavy metals and their compounds, Dyes, Detergents , Quaternary ammonium compounds, Aldehydes-Formaldehyde, Gaseous agents-Ethylene oxide</p> <p>e) Evaluation of antimicrobial chemical agents</p> <p>B.Chemotherapeutic agents</p> <p>a) Chemotherapeutic agents and chemotherapy</p> <p>b) Antibiotics: Definition, Characteristics of antibiotics that qualify them as chemotherapeutic agents.</p> <p>Antibiotics and their mode of action:</p> <p>i) Inhibition of cell wall synthesis: penicillins, bacitracin</p> <p>ii) Damage to cytoplasmic membrane</p> <p>iii) Inhibition of nucleic acid and protein synthesis: streptomycin</p> <p>iv) Inhibition of specific enzyme systems: sulphonamides</p>	

Teaching-Learning Methodology	<ul style="list-style-type: none"> • 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. • These sessions incorporate space for participation and involvement of students through questions.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written CEE.	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Have understanding of growth of prokaryotes in batch culture, continuous culture and their applications.
2.	Have a better understanding about fundamentals of control and various terms such as sanitizers, disinfectants, germicidal agents etc.
3.	Have knowledge about varied physical and chemical agents for the control of microorganisms.

Suggested References:	
Sr. No.	References:
1.	“Microbiology” – Michael J. Pelczar, E.C.S.Chan and Noel R. Krieg , 5th edition, Tata McGRAW –HILL Edition,1993.
2.	A handbook of elementary Microbiology by H.A. Modi, Shanti Prakashan, Rohtak Haryana
3.	Principles of Microbiology, Ronald m. Atlas, 2 nd Edition, Wm. C. Brown publishers, 1995

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

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SARDARPATELUNIVERSITY
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Major subject)

Course Code	US03MAMIC02	Title of the Course	Elements of Microbiology
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<ul style="list-style-type: none"> • To know about diversity in microorganisms. • To know general characteristics and significance of eukaryotic microbes: fungi, algae and protozoa. • To understand about viruses as acellular microbes. • To know about sub viral entities like prions and viroids • To make student know about bacteria with unusual properties. • To make students know about basic principles of instruments used in Microbiology.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p>Eukaryotic Microbes: The Fungi</p> <p>a) General characters of fungi</p> <p>i. Thallus</p> <p>ii. Kinds of mycelia</p> <p>iii. Structure of fungal cell</p> <p>iv. Fungal flagella</p> <p>v. Aggregation and modification of hyphae</p> <p>vi. Nutrition in fungi</p> <p>vii. Reproduction in fungi</p> <p>Viii Parasexual cycle</p> <p>b) Economic importance of fungi</p>	25%
2.	<p>Eukaryotic and acellular Microbes: Algae, Protozoa and Introduction to Viruses</p> <p>a) Algae: introduction, occurrence, Biological and economical importance, morphology, pigments, motility, reproduction.</p> <p>b) Protozoa: occurrence, ecology, symbiotic protozoa, importance, morphology, reproduction.</p> <p>c) Viruses: General properties of viruses: Introduction, Morphology, chemical properties, viral multiplication, and cultivation of viruses.</p> <p>d) Subviral particles: Introduction to Prions, Viroids.</p>	25%



3.	<p>Prokaryotes with different / unusual properties</p> <p>a) Bacteria with unusual morphology (i) Budding and appendaged bacteria (ii) Filamentous bacteria: actinomycetes iii) Sheathed bacteria iv) Mycoplasma v) cyanobacteria vi) spirochaetes</p> <p>b) Bacteria with gliding motility introduction, Myxobacters and Baggiotoa</p> <p>c) Rickettsia and chlamydia</p> <p>d) Archaeobacteria</p>	25%
4.	<p>Basic Instruments and techniques to study Microbiology</p> <p>a) Spectroscopy: Beers and Lamberts law, Principle , working and application of UV and visible spectrophotometer</p> <p>b) Centrifugation: Principles of centrifugation, separation methods in preparative centrifugation, differential and density gradient centrifugation</p> <p>c) Chromatography : Principles of chromatography, Types of chromatography working and applications of Thin Layer Chromatography</p>	

Teaching-Learning Methodology	<p>The teaching- learning process will consist of lectures (large group) in which the teacher will use aids such as chalk as well as make power point presentation to introduce the topics encompassing the basic concepts of the subject.</p> <p>Growing fungi in labs, observing protozoa and algae in hay infusion and other natural samples. Can also arrange photography sessions and can have albums of various fungi and mushrooms in rainy season at their natural habitat.</p>
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination CEE	50%
3.	University Examination	50%



Course Outcomes: Having completed this course, the learner will be able to

1.	Gain knowledge of general characteristics and importance of fungi, algae, protozoa, and viruses.
2.	Give examples of bacteria with unusual properties and can get knowledge of diverse groups of bacteria with distinguish characteristics.
3.	Understand importance of normal microbiota of human body and can give examples of bacteria and other microbes present in various parts of the healthy human body.
4.	Understand types Instruments and techniques to study microbiology

Suggested References:

Sr. No.	References
1.	“Microbiology” – Michael J. Pelczar, E.C.S.Chan and Noel R. Krieg , 5th edition, Tata McGRAW –HILL Edition,1993
2	Prescott L, Harley J P, and Klein D A, Microbiology, 7 th edition. WmC.Brown - McGraw Hill, Dubuque, IA ltd.
3.	Biophysical chemistry: Principles and techniques by Upadhyay Upadhyay and Nath

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

On-line Resources



SARDARPATELUNIVERSITY
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Major subject)

Course code	US03MAMIC03	Title of the Course	Practical in Microbiology for SEM-3 Section 1 and 2
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	<p>To demonstrate:</p> <ul style="list-style-type: none"> • Understanding of how environmental factors affect the growth of microorganisms. • The use of instruments like visible spectrophotometer, centrifuge machine, Autoclave, hot air oven • Cultivation and study of eukaryotic microbes like yeast and fungi • Practical knowledge of control of micro organisms
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Course Content		
No.	Practicals of Microbiology for B.Sc.SEM-3	Weight age* (%)
	SECTION-1	
1.	Measuring growth of bacteria by Standard plate count method.	
2.	Effect of environmental factors on the growth of Bacteria :Temperature	
3	Effect of environmental factors on the growth of Bacteria : pH	
4.	Study of Oligodynamic action of Heavy Metal on bacteria.	
5.	Spectrum Study of an antibiotic by Agar ditch method.	
6.	Effect of antimicrobial agents on the growth of bacteria by paper disc method (Antibiotic, Phenol, Crystal Violet, HgCl ₂).	
7	Study and demonstration of how to use instruments: visible spectrophotometer, centrifuge machine, Autoclave, hot air oven.	



	SECTION-2	
8.	Study of eucaryotic microbes in hay infusion	
9	Isolation and cultivation of yeast	
10	Cultivation and Study of fungi: <i>Aspergillus</i> , <i>Penicillium</i> , <i>Rhizopus</i> and <i>Mucor</i> .	
11	To Study cultural characteristics of actinomycetes : filamentous bacteria	
12	Study of viral and fungal diseases of plants: Mosaic, red rot, rust, smut, wilt, Leaf curl, powdery mildew, downy mildew.	

Teaching-Learning Methodology	<ul style="list-style-type: none"> • 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. • Students are trained for microscope observations and its handling. • Demonstrations of the practical are also carried out and care is taken for aseptic handling and skill development for microbiological work in the laboratory. • Possibility of various results and their interpretation is also discussed.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination (CCE)	50%
2.	University Examination	50%
	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.	Learn the use of common laboratory equipments like spectrophotometer, autoclave, centrifuge and hot air oven
2.	Become proficient at safety procedures and microbial handling techniques.
3.	Acquire requisite laboratory skills in cultivation of different microorganisms.
4.	Comprehend the basic fundamental knowledge of how microorganisms respond to environmental factors like temperature, pH, various chemicals and antibiotics.
5.	Learn to cultivate and observe various types of prokaryotes and Eucaryotes.

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



SARDARPATELUNIVERSITY
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Minor subject)

Course Code	US03MIMIC01	Title of the Course	Introduction to microbial physiology
Total Credits of the Course	2	Hours per Week	2

Course Content		
Unit	Description:	weightage%
1.	<p>CONCEPTS OF GROWTH</p> <p>A. Basic concepts</p> <p>a) Nutrient Uptake and transport</p> <p>b). Modes of reproduction(cell division) in bacteria</p> <p>B. Growth in prokaryotes:</p> <p>a) Introduction</p> <p>b) Mathematical nature and expression of growth</p> <p>c) Normal growth curve of microbial population in batch culture system: lag phase,exponential phase, stationary phase, death phase, and transitional periods between growth phases.</p>	50%
2.	<p>CONTROL OF MICROORGANISMS</p> <p>Definition of terms: Sterilization, Germicide, Microbicide, Bactericide and Bacteriostasis</p> <p>Physical agents</p> <p>a) High temperature</p> <p>b) Low temperature</p> <p>Antibiotics:</p> <p>a) Definition, Characteristics of antibiotics that qualify them as chemotherapeutic agents.</p> <p>b) Antibiotics and their mode of action:</p> <p>i) Inhibition of cell wall synthesis: penicillins, bacitracin</p> <p>ii) Damage to cytoplasmic membrane</p> <p>iii) Inhibition of nucleic acid and protein synthesis: streptomycin</p> <p>iv) Inhibition of specific enzyme systems: sulphonamides</p>	50%

Teaching-Learning Methodology	<ul style="list-style-type: none"> • 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. • These sessions incorporate space for participation and involvement of students through questions.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Have understanding of growth of prokaryotes in batch culture, continuous culture and their applications.
2.	Have a better understanding about fundamentals of control and various terms such as sanitizers, disinfectants, germicidal agents etc.
3.	Have knowledge about varied physical and chemical agents for the control 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.

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SARDARPATELUNIVERSITY
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Minor subject)

Course Code	US3MIMIC02	Title of the Course	Microbiology Practicals
Total Credits of the Course	2	Hours per Week	4
Course Objectives:	<ul style="list-style-type: none"> • Understanding of how environmental factors affect the growth of microorganisms. • The use of instruments like visible spectrophotometer, centrifuge machine, Autoclave, hot air oven • Get practical knowledge of control of micro organisms 		

Course Content:		
Sr. No.	Practicals:	Weightage (%)
1.	Effect of environmental factors on the growth of Bacteria :Temperature	100 %
2.	Effect of environmental factors on the growth of Bacteria : pH	
3.	Study of Oligodynamic action of Heavy Metal on bacteria.	
4.	Spectrum Study of an antibiotic by Agar ditch method.	
5.	Effect of antimicrobial agents on the growth of bacteria by paper disc method (Antibiotic, Phenol, Crystal Violet, HgCl ₂).	
6.	Study and demonstration of how to use instruments: visible spectrophotometer, centrifuge machine, Autoclave, hot air oven.	

Teaching-Learning Methodology	<ul style="list-style-type: none"> • 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. • Students are trained for microscopic observations and its handling. • Demonstrations of the practical are also carried out and care is taken for aseptic handling and skill development for microbiological work in the laboratory. • Possibility of various results and their interpretation is also discussed.
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Evaluation Pattern:		
Sr. No.	Details of the Evaluation:	Weightage %
1	Internal Examination (CCE)	50%
2	University Examination	50%
3	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.	Learn the use of common laboratory equipments like spectrophotometer, autoclave, centrifuge and hot air oven
2.	Become proficient at safety procedures and microbial handling techniques.
3.	Acquire requisite laboratory skills in cultivation of different microorganisms.
4.	Comprehend the basic fundamental knowledge of how microorganisms respond to environmental factors like temperature, pH, various chemicals and antibiotics.

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
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Inter disciplinary)

Course Code	US03IDMIC01	Title of the Course	Introduction to control of Microorganisms
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make the students familiar with: <ul style="list-style-type: none"> • Control of microorganisms both by physical and chemical agents. • Concepts of chemotherapy • Antibiotics and their use
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Course Content		
Unit	Description:	weightage%
1.	<p>Control by physical agents</p> <p>A. Fundamentals of control</p> <p>a) Definition of terms: Sterilization, Germicide, Microbicide, Bacteriocide and Bacteriostasis</p> <p>b) Condition influencing antimicrobial action</p> <p>c) Mode of action of antimicrobial agents.</p> <p>B. Physical agents</p> <p>a) High temperature</p> <p>b) Low temperature</p> <p>c) Radiation</p> <p>d) Filtration</p>	50%
2.	<p>Control by Antibiotics:</p> <p>Antibiotics: Definition, Characteristics of antibiotics that qualify them as chemotherapeutic agents.</p> <p>Antibiotics and their mode of action:</p> <p>i) Inhibition of cell wall synthesis: penicillins, bacitracin</p> <p>ii) Damage to cytoplasmic membrane</p> <p>iii) Inhibition of nucleic acid and protein synthesis: streptomycin</p> <p>iv) Inhibition of specific enzyme systems: sulphonamides</p>	50%



Teaching-Learning Methodology	<ul style="list-style-type: none"> • 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. • These sessions incorporate space for participation and involvement of students through questions.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to:	
1.	Understand how micro organisms are controlled by physical agents
2.	Gets the knowledge of antibiotics and their use.

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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SARDARPATELUNIVERSITY
B.Sc. Microbiology Semester: III
With Effect From: June – 2024
(Inter disciplinary)

Course Code	US03IDMIC02	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"> • Understanding of various laboratory equipment and use of microscope. • Microbial handling techniques and disposal of laboratory waste. • Basic skills like preparation of smear, culture media & reagents as well as illustrating staining techniques to visualize bacterial cell using light microscope. 		

Course Content:		
Sr. No.	Practical: Based on theory course :	Weightage (%)
1.	Study of Oligodynamic action of Heavy Metal on bacteria.	100 %
2.	Spectrum Study of an antibiotic by Agar ditch method.	
3.	Effect of antimicrobial agents on the growth of bacteria by paper disc method (Antibiotic, Phenol, Crystal Violet, HgCl ₂).	
4.	Study and demonstration of how to use instruments: Autoclave	
5.	Study and demonstration of how to use instruments: bacteriological filters	
6.	Study and demonstration of how to use instruments: hot air oven	

Teaching-Learning Methodology	<ul style="list-style-type: none"> • 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. • Students are trained for microscopic observations and its handling. • Demonstrations of the practical are also carried out and care is taken for aseptic handling and skill development for microbiological work in the laboratory. • Possibility of various results and their interpretation is also discussed.
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Evaluation Pattern:		
Sr. No.	Details of the Evaluation:	Weightage %
1	Internal Evaluation CCE	50%
2.	External University Examination	50%
3	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.	Learn the use of common laboratory equipments like spectrophotometer, autoclave, centrifuge and hot air oven
2.	Become proficient at safety procedures and microbial handling techniques.
3.	Comprehend the basic fundamental knowledge of how microorganisms can be controlled by agents like dry heat, vapour under pressure, , various chemicals and antibiotics.

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

