



Bachelor of Science

B.Sc. Microbiology

(Major subject)

Course Code	US03MAMIC01	Title of the Course	MICROBIAL PHYSIOLOGY
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make the students familiar with: • 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.	Microbial growth and growth curve A. Uptake and transport of nutrients in bacteria B. Reproduction in bacteria a) Modes of cell division (Binary division , Budding , Fragmentation, formation of conidiospores or sporangiospores) b) New cell formation C. Growth in Bacteria a) Calculation of geometric progression of growth b) Normal growth curve of bacteria in batch culture c) Transitional periods between growth phases	25%



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2	Types and measurement of growth A) Synchronous growth B) Continuous culture C) Diauxic growth D) Quantitative measurement of Bacterial Growth on the basis of : a) Cell Count (Direct microscopic count , Electronic enumeration of cell numbers , Plate count method , Membrane filter count) b) Cell Mass (Turbidimetric method, Determination of N ₂ content, Determination of dry weight of cells) c) Cell Activity (Measurement of a specific chemical change produced on a constituent of the medium , The relation of turbidity measurements to direct expression of growth) E) Importance of qualitative measurement of growth.	25%
3.	Control of microorganisms by physical agents A) Fundamentals of control a) Definition of terms: Sterilization, Germicide, Bactericide and Bacteriostasis b) The Rate of Death of Bacteria c) Condition influencing antimicrobial action (Environment , Kinds of Microorganisms and Physiological state of cells) d) Mode of action of antimicrobial agents. B) Physical agents a) High temperature • Thermal death time , decimal reduction time • Practical application of high temperature • Moist heat :- steam under pressure , fraction sterilization , boiling water , Pasteurization • Dry heat : Hot air sterilization , Incineration b) Low temperature c) Desiccation d) Osmotic pressure e) Radiation f) Surface Tension and Interfacial tension g) Filtration	25%





4.	Control of microorganisms by chemical agents A) Chemical agents a) Definition of terms: Sanitizer , disinfectant, Antiseptic, Antimicrobial agent b) Characteristics of an ideal antimicrobial chemical agents c) Selection of chemical agent for practical application d) Major groups of chemical Antimicrobial agents: • Mode of action and application of : 1) Phenol and phenolic compounds 2) Alcohol 3) Halogens 4) Heavy metals and their compounds 5) Dye 6) Detergents 7) Quaternary ammonium compounds 8) Aldehydes 9) Gaseous agents e) Evaluation of antimicrobial chemical agents B) Chemotherapeutic agents a) Chemotherapeutic agents and chemotherapy b) Antibiotics: Definition, Characteristics of antibiotics that qualify them as chemotherapeutic agents. c) Antibiotics and their mode of action: i) Inhibition of cell wall synthesis: penicillins, bacitracin ii) Damage to cell membrane iii) Inhibition of nucleic acid and protein synthesis: streptomycin iv) Inhibition of specific enzyme systems: sulphonamides	25%
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Teaching- Learning Methodology	- 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





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B. Sc. (Microbiology) Semester III

Course Code	US03MAMIC02	Title of the Course	Microbial Diversity
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	• 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.
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Course Content		
Unit	Description	Weightage(%)
1.	Eukaryotic Microorganisms : The Fungi A) Distribution (Habitat) B) Distinguishing characteristics C) Somatic or vegetative phase i. Thallus ii. Kinds of mycelia iii. Structure of fungal cell iv. Fungal flagella v. Aggregation and modification of hyphae vi. Nutrition in fungi vii. Reproduction in fungi D) Parasexual cycle E) Economic importance of fungi	25%
2.	Eukaryotic Microorganisms: Algae and protozoa A) Algae a) Introduction b) Distribution c) Morphology d) Pigments e) Nutrition and reproduction f) Significance of Algae	25%





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	B) Protozoa: a) Introduction b) Distribution c) Morphology d) Locomotory organs e) Nutrition f) Reproduction g) Importance	
3.	Viruses and other acellular entities 1) Viruses A) Introduction B) General Properties C) Structure of Viruses a) Size of Virions b) General Morphology and Components: - Nucleic acid, Capsid, Envelope and Enzymes D) Cultivation E) Introduction to Types of Viruses (Bacterial, Animal, Plant) F) Bacteriophages: a) General characters b) Classification c) Morphology d) Bacteriophages of <i>E.coli</i> e) Multiplication of Phages (Virulent and Temperate): - T-even phages and Lytic cycle λ phages and lysogeny 2) Prions and Viroids	25%
4.	Atypical prokaryotes A) Bacteria with unusual morphology (i) Budding and appendaged bacteria (ii) Filamentous bacteria: actinomycetes (iii) Sheathed bacteria (iv) Mycoplasma (v) Cynobacteria (vi) Spirochaetes B) Bacteria with gliding motility Introduction to Myxobacteria and Beggiotoa C) Rickettsia and Chlamydia D) Archaeobacteria	25%





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Teaching- Learning Methodology	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. 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.
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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.

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.



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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:	To demonstrate: • Understanding of how environmental factors affect the growth of microorganisms. • Cultivation and study of eukaryotic microbes like yeast and fungi as well as viruses • Practical knowledge of control of micro organisms
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Course Content		
No.	Practicals of Microbiology for B.Sc. SEM-3	Weightage (%)
	SECTION-1	50%
1.	Measuring growth of bacteria by Standard plate count method	
2.	Study of Effect of environmental factors on the growth of Bacteria : Temperature	
3	Study of Effect of environmental factors on the growth of Bacteria : pH	
4.	Study of Effect of environmental factors on the growth of Bacteria: Osmotic Pressure	
5.	Study of Oligodynamic action of Heavy metal on bacteria.	
6.	Spectrum Study of an antibiotic by Agar ditch method.	
7.	Study of Effect of antimicrobial agents on the growth of bacteria by agar cup method (Antibiotic, Phenol, Crystal Violet).	



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	SECTION-2	50%
8.	Detection of bacteriophage by spot test	
9.	Study of eucaryotic microbes in hay infusion	
10.	Isolation and cultivation of yeast	
11.	Cultivation and Study of fungi: <i>Aspergillus</i> , <i>Penicillium</i> , <i>Rhizopus</i> and <i>Mucor</i> .	
12.	Study of cultural characteristics of actinomycetes : filamentous bacteria	
13.	Study of viral and fungal diseases of plants: Mosaic, red rot, rust, smut, wilt, Leaf curl, powdery mildew, downy mildew.	

Teaching-Learning Methodology	• 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 and Viruses.

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

