

UG Semester 7

Semester:	UG 7	
Course :	MINOR	
Paper Title:	APPLIED MICROBIOLOGY	
Paper code:	B4MB230711T	Credits: 4
Hours/week :	4	
Category: Core/MDC/SEC/VAC :	Core	
Theory / Practical / Composite :	Theory	
No of Modules :	No	
Course Overview: This course provides a concise overview of medical, environmental, and applied microbiology, emphasizing the role of microorganisms in human health, disease, environment, and industry. It introduces host–pathogen interactions, normal microflora, opportunistic, nosocomial and iatrogenic infections, along with major bacterial and viral diseases, their transmission, prevention, and control. The course also covers antibiotic resistance and its significance in public health.		
The environmental and applied component focuses on microbial detection and enrichment techniques, pathogenic microorganisms in air, water and soil, food microbiology, probiotic foods, and the beneficial applications of microorganisms as biopesticides, biofertilizers and agents of bioremediation, as well as their role in biodeterioration.		
Course Outcome:		
1. Remember: Recall the fundamental concepts of host–pathogen interactions, normal microflora, opportunistic pathogens, nosocomial and iatrogenic infections, and identify the causal agents of major bacterial and viral diseases.		
2. Understand: Explain the symptoms, modes of transmission, prophylaxis, and control measures of important bacterial and viral diseases, including infections caused by <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , <i>Salmonella typhi</i> , <i>Haemophilus influenzae</i> , <i>Bacillus anthracis</i> , and <i>Mycobacterium tuberculosis</i> , as well as hepatitis, dengue, AIDS, herpes, and COVID-19.		
3. Analyze: Analyze the occurrence, transmission, and significance of pathogenic microorganisms in air, water, soil, and food, and differentiate between beneficial, opportunistic, and pathogenic microorganisms in different environmental contexts.		
4. Apply: Apply appropriate microbiological techniques, including enrichment culture and selective/differential media such as XLD agar, <i>Salmonella–Shigella</i> agar, Mannitol Salt agar, EMB agar, MacConkey agar, and Sabouraud Dextrose agar, for the detection and identification of specific microorganisms.		
5. Evaluate: Evaluate the factors contributing to antibiotic resistance and assess appropriate strategies for prevention and control of infectious diseases, food-borne infections, and environmental microbial contamination.		
6. Create: Design microbiology-based approaches for addressing real-world problems, including the use of probiotics for health benefits, microorganisms as biopesticides and biofertilizers, and microbial processes for biodeterioration control and bioremediation of pollutants such as hydrocarbons from oil spills.		
Prerequisites: <i>Basic knowledge about any prior course</i>		
SYLLABUS		

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.	Medical Microbiology • Host-Pathogen Interactions; Normal microflora and opportunistic pathogens; Nosocomial and iatrogenic infections. • Bacterial diseases including causal agents, symptoms, mode of transmission, prophylaxis and control: <i>Staphylococcus aureus</i>, <i>Escherichia coli</i>, <i>Salmonella typhi</i>, <i>Haemophilus influenzae</i>, <i>Bacillus anthracis</i>, <i>Mycobacterium tuberculosis</i>. • Viral diseases including causal agents, symptoms, mode of transmission, prophylaxis and control: Hepatitis, Dengue, AIDS, Herpes, COVID. • Antibiotic resistance.	24	CO1, CO2, CO5	K1,K2,K5
II.	Environmental and Applied Microbiology • Enrichment culture techniques, Detection of specific microorganisms on-XLD agar, Salmonella-Shigella agar, Mannitol Salt agar, EMB agar, McConkey agar, Saboraud Dextrose agar. • Concept of pathogenic microorganisms in Air, Water and Soil. • Role of microorganisms in Food Microbiology. • Probiotic Foods- Definition, types, microorganisms and health benefits. • Microorganisms used as biopesticides, biofertilizers, biodeterioration and	24	CO3, CO4, CO5, CO6	K3,K4,K5,K6

	bioremediation (e.g. hydrocarbons in oil spills).			
Text Books				
1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education 2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition 3. Cappuccino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited 4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International. 5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers. 6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company. 7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan				
Suggested readings				
1. Powerpoint slides provided in class				
Web Resources				
1. . Advanced Microbiology online MOOC course by Dr Arup Kumar Mitra- https://onlinecourses.swayam2.ac.in/cec22_bt20/preview				
Evaluation Theory CIA: 30 Semester Exam:70				
Paper Structure for Theory Semester Exam: Short questions: 10 (each 2 marks) from 12 (10x2=20) Long questions: 5 (each 10 marks) from 7 (5x10=50)				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember: Recall the fundamental concepts of host–pathogen interactions, normal microflora, opportunistic pathogens, nosocomial and iatrogenic infections, and identify the causal agents of major bacterial and viral diseases.	K1
CO2	Understand: Explain the symptoms, modes of transmission, prophylaxis, and control measures of important bacterial and viral diseases, including infections caused by <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , <i>Salmonella typhi</i> , <i>Haemophilus influenzae</i> , <i>Bacillus anthracis</i> , and <i>Mycobacterium tuberculosis</i> , as well as hepatitis, dengue, AIDS, herpes, and COVID-19.	K2
CO3	Analyze: Analyze the occurrence, transmission, and significance of pathogenic microorganisms in air, water, soil, and food, and differentiate between	K3

	beneficial, opportunistic, and pathogenic microorganisms in different environmental contexts.	
CO4	Apply: Apply appropriate microbiological techniques, including enrichment culture and selective/differential media such as XLD agar, Salmonella–Shigella agar, Mannitol Salt agar, EMB agar, MacConkey agar, and Sabouraud Dextrose agar, for the detection and identification of specific microorganisms.	K4
CO5	Evaluate: Evaluate the factors contributing to antibiotic resistance and assess appropriate strategies for prevention and control of infectious diseases, food-borne infections, and environmental microbial contamination	K5
CO6	Create: Design microbiology-based approaches for addressing real-world problems, including the use of probiotics for health benefits, microorganisms as biopesticides and biofertilizers, and microbial processes for biodeterioration control and bioremediation of pollutants such as hydrocarbons from oil spills.	K6