

As Per NEP 2020

University of Mumbai



Syllabus for Basket of OE Vertical 3

Faculty of Science

Board of Studies in Microbiology

Second Year Programme

Semester

IV

Title of Paper

Credits

I) MICROBES & ENVIRONMENT

2

From the Academic Year

2025-26

Title of Paper MICROBES & ENVIRONMENT

Sr. No.	Heading	Particulars
1	Description of the course : Including but Not limited to :	This course explores the role of microorganisms in the environment, focusing on their ecological interactions, processes, and applications in sustainability. The course covers microbial ecology fundamentals, including microbial diversity, symbiotic relationships, and their significance in nutrient cycling. The course also examines microbial applications in bioremediation and waste management. Students will develop an understanding of microbial functions in nature, through theoretical concepts and practical insights. The course emphasizes on the role of microbes in maintaining environmental balance, contributing to ecological conservation and sustainable environmental management.
2	Vertical :	Open Elective
3	Type :	Theory
4	Credit:	2 credits (1 credit = 15 Hours for Theory)
5	Hours Allotted :	30 Hours
6	Marks Allotted:	50 Marks
7	Course Objectives: CO 1: To understand the basics of microbial ecology and the role of microorganisms in the environment. CO 2: To learn about the interactions between microorganisms and their environment. CO 3: To explore microbial diversity in different ecosystems and their ecological significance. CO 4: To analyze the role of microorganisms in biogeochemical cycles and nutrient recycling. CO 5: To assess the impact of human activities on microbial ecosystems and environmental health. CO 6: To examine microbial applications in pollution control, bioremediation, and sustainable environmental management.	
8	Course Outcomes: On completion of this course learner will be able to: OC1: Recall the fundamental principles of microbial ecology and their environmental importance. OC2: Describe various microbial interactions and their ecological roles in different habitats. OC3: Apply microbial-based solutions for environmental sustainability, waste management, and bioremediation.	

	OC4: Evaluate the effects of human-induced changes, such as pollution and climate change, on microbial communities. OC5: Elaborate on microbial processes in decomposition, nutrient cycling, and ecosystem functioning.
9	Modules

Course code	SEMESTER IV	Credits
	Open Elective Course (MICROBES & ENVIRONMENT)	Credits 2 (30 L/hr)
Module 1	Microbial Ecology and Environmental Interactions	15 Lectures
1.1	Definition and scope of Microbial ecology	3
1.2	Diversity of microorganisms (bacteria, archaea, fungi, viruses), Role in the environment with two examples of each , Nitrogen fixing bacteria, Global warming, Crop diseases	6
1.3	Role of Microbes in nutrient cycling and decomposition	3
1.4	Human impact on microbial ecosystems (pollution, climate change)	3
Module 2	Role of Microbes in Environmental Sustainability	15 Lectures
2.1	Goals of Sustainability	2
2.2	Biofertilizers and Biopesticides	6
2.3	Microorganisms in Waste management and degradation of pollutants air (CO, NO ₂), Soil (Chemicals), Water (Industrial waste)	7
10	Text Books: 1. Fundamentals of Microbiology, 9th Edition , Frobisher, Hinsdill, Crabtree, Goodheart, 1974, Saunders College Publishing 2. Environmental Studies: From crisis to cure, Rajagopalan R., Oxford Higher Education. 3. A TextBook in Environmental Science, V. Subramanian, Narosa Publishing House. 2002. 4. Singh, J. S., & Kashyap, A. K. (2006). <i>Microbial Ecology</i>. APH Publishing. 5. Biopesticides: An eco-friendly approach for pest control Journal of Biopesticides 3(1 Special Issue) 186 - 188 (2010) 186,Suman Gupta and A. K. Dikshit 6. Management of Municipal solid waste; Environmental Engineering Series, T. V. Ramchandra, Publ.Commonwealth of Learning, Indian Institute of Science (IISCBangalore.2011.	

11	Reference Books: 1. Introduction to Environmental Microbiology – Barbara Kolwzan , Waldemar Adamiak (E Book) 2. Pollution Control in Process Industries, S.P. Mahajan, TMH 1988. 3. M. H. Fulekar, Environmental Biotechnology 4. D.P. Singh and S.M. Dwivedi, Environmental Microbiology and Biotechnology 5. R. C. Dubey, A Textbook of Biotechnology 6. S.K. Agarwal , Environmental Biotechnology 7. Indu Shekhar Thakur, Environmental Biotechnology - Basic Concepts and Applications
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12	Internal Continuous Assessment: 40%	External, Semester End Examination 60% Individual Passing in Internal and External Examination																										
13	Continuous Evaluation through: Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)	As per paper pattern*																										
14	Format of Question Paper: for the final examination *Paper Pattern for 30 marks : 30 Marks per paper Semester End Theory Examination: Duration - These examinations shall be of one hour duration <table><tr><td>Question</td><td>Option</td><td>Marks</td><td>Questions Based on</td></tr><tr><td>Q1A</td><td>Attempt any two out of four (5 marks each)</td><td>10</td><td>Based on Module 1</td></tr><tr><td>Q1B</td><td>Attempt any five out of ten objective (MCQ type only) questions (1 marks each)</td><td>5</td><td>Based on Module 1</td></tr><tr><td>Q2A</td><td>Attempt any two out of four (5 marks each)</td><td>10</td><td>Based on Module 2</td></tr><tr><td>Q2B</td><td>Attempt any five out of ten objective (MCQ type only) questions (1 marks each)</td><td>5</td><td>Based on Module 2</td></tr><tr><td colspan="2">Total</td><td>30</td><td></td></tr></table>				Question	Option	Marks	Questions Based on	Q1A	Attempt any two out of four (5 marks each)	10	Based on Module 1	Q1B	Attempt any five out of ten objective (MCQ type only) questions (1 marks each)	5	Based on Module 1	Q2A	Attempt any two out of four (5 marks each)	10	Based on Module 2	Q2B	Attempt any five out of ten objective (MCQ type only) questions (1 marks each)	5	Based on Module 2	Total		30	
Question	Option	Marks	Questions Based on																									
Q1A	Attempt any two out of four (5 marks each)	10	Based on Module 1																									
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Q2A	Attempt any two out of four (5 marks each)	10	Based on Module 2																									
Q2B	Attempt any five out of ten objective (MCQ type only) questions (1 marks each)	5	Based on Module 2																									
Total		30																										

Sd/-
Sign of BoS
Coordinator
Dr. Aparna Dubhashi
BoS in Microbiology

Sd/-
Sign of the
Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science &
Technology

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Faculty of Science &
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