

Course: MICROBIOLOGY PG

Semester	2
Paper Number	MMCB4211
Paper Title	ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY
No of credits	6
Non composite/composite	Composite
No. of periods assigned	6
Course description/objective	<ul style="list-style-type: none"><li>• To know the microbiology of air and water</li><li>• To the microbiology of soil, bioremediation and agricultural microbiology</li><li>• To isolate, identify and characterize the microorganisms from air, water and soil</li></ul>
Reference List	1.Mitra and Chakraborty (2021) Mycology and Phytopathology. Taurean Publishers New Delhi. 2. Rangaswamy and Bharadwaj (2015) Agricultural Microbiology. PHI Learning Pvt. Ltd. 3. Aithal, Wakte and Manwar(2010) Air Microbiology. Cinamonteal Publishers. 4. Charles P. Gerba, Ian L. Pepper. Environmental Microbiology 5. Pradipta K. Mohapatra. Textbook of Environmental Microbiology 6. Larry L. Barton, R.J.C. McLean. Environmental Microbiology and Microbial Ecology
Evaluation	Theory: 70 (60 End sem + 10 CIA) Practical: 30 (10 End sem + 20 CIA) <b>Question Paper format: theory end semester</b> <b>Module 1: 30 marks</b> SHORT QUESTION: FROM 7 QTNS <b>ANSWER 5 (EACH 2 MARKS)</b> = 5X2=10 LONG QUESTION: FROM 6 QTNS <b>ANSWER 4 (EACH 5 MARKS)</b> = 4X5=20  <b>Module 2: 30 marks</b> SHORT QUESTION: FROM 7 QTNS <b>ANSWER 5 (EACH 2 MARKS)</b> = 5X2=10 LONG QUESTION: FROM 6 QTNS <b>ANSWER 4 (EACH 5 MARKS)</b> = 4X5=20  Viva: End sem 10 marks

## ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

### THEORY: 70 MARKS

#### ❖ **Module 1: Environmental Microbiology (35 MARKS)**

**Water microbiology: Distribution of microorganisms in the aquatic environments:** fresh water and sea water microflora. Microorganisms and water quality, water pollution. Water purity test and indicator organisms, method used in environmental studies –BOD, COD, DO. Common water borne disease and their control measure. Water purification: flocculation, chlorination and purification. Assessment of microbial status in water and waste water.

**Microbiology of wastewater and solid waste treatment:** - MPN determination, enumeration and identification techniques of waterborne microorganisms, distinguish between faecal and non faecal coliforms (IMViC test), Waste types-solid and liquid waste characterization, primary, secondary and tertiary treatments: trickling filter, oxidation ponds and stabilization ponds, principle of aerobic and anaerobic digestion. [SSC]

**Biology of atmosphere:** Source and kinds of microorganisms present in the atmosphere, techniques for microbiological sampling of air. Air-borne disease and their control. (AKM)

#### ❖ **Module 2: Soil and Agriculture Microbiology (35 MARKS)**

**Biology of lithosphere:** Soil as a habitat for microorganisms, methods of studying microorganisms and their activities in soil. Increasing soil fertility by chemical and biofertilizer. Biology and biochemistry of N<sub>2</sub>-fixation, Biochemical transformation of inorganic and organic nitrogen compounds. Microbial degradation of cellulose, hemicelluloses, lignin, xylans, starch and pectin. Biodegradation of petroleum hydrocarbons, pesticides, herbicides and xenobiotics, Bioremediation [DD]

**Bioremediation:** Metal-microbe interactions, Microbial control of pollution by microbes POPs and heavy metals [AKM]

**Agricultural Biology:** Rhizosphere and phyllosphere microorganisms and their interactions with plants. Plant pathogen (bacterial and fungal) Mechanisms of plant pathogenicity, symptoms of plant diseases, transmission of plant diseases. Signalling events in pathogenesis and resistance to pathogens. Molecular basis of plant disease control along with cultural practices, chemical control and biological control. Microbial control of insects. Beneficial association between plants and microorganisms (association of plants with cyanobacteria, actinomycetes and fungus). Biopesticides and biocontrol agents. SAR and ISR. Integrated Pest Management. [AKM]

### PRACTICAL 30 MARKS

1. Isolation of microbes from soil, air and water by specific methods, their characterization, interaction, Role of PGPR and their importance on plant growth. Identification on the basis of morphology and cultural characteristics. (AKM)
2. WATER MICROBIOLOGY (MM)
3. Determination of the Most Probable Number [MPN] of coliform bacteria.
4. Confirmatory Test for the presence of coliform bacteria after MPN Test

5. Determination of Dissolved oxygen[DO] and Biochemical oxygen demand [BOD] in watersample
6. Determination of COD of the watersample.
7. To estimate the amount of chlorine present in water sample by titrationmethod.
8. Measurement of microbial activity in soil by soil respirationmethod.
9. Determination of total alkalinity of a watersample.

**Reference:**

1. Mitra and Chakraborty (2021) Mycology and Phytopathology. Taurean Publishers NewDelhi.
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