INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**BACHELOR OF SCIENCE (MICROBIOLOGY)**
SEMESTER	**4**
COURSE TITLE	**ENVIRONMENTAL MICROBIOLOGY**
COURSE CODE	**02MB0255**
COURSE CREDITS	**4**

Objective:

1 To study the microbial distribution among environmental components like soil and water and also to study role of microorganisms in water and wastewater treatment processes.

Course Outcomes: After completion of this course, student will be able to:

1 To understand the soil structure, soil microflora and biogeochemical cycle

2 To correlate the role of microorganisms in aquatic ecosystem

3 Perform basic experiment related to microbiological examination of water and wastewater.

4 To know different stages of waste water treatment and role of microorganisms in these processes.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Soil Microbiology** Soil structure – Functions of soil, Study of soil, Composition and types of soil Microbial flora of soil – Function and types of soil microflora Microorganism interactions: Natural, Positive and negative associations Significance of biogeochemical cycles Biochemical transformation of nitrogen and nitrogen compounds- Nitrogen fixation, symbiotic nitrogen fixers, Proteolysis, Ammonification or amino acid degradation, Nitrification, Assimilatory nitrate reduction, Dissimilatory nitrate reduction. Biochemical transformation of carbon and carbon compounds- Organic carbon formation, Cellulose degradation, Hemicellulose degradation, Lignin degradation, Pectic substances degradation, Humus formation. Biochemical transformation of sulfur and sulfur compounds Biochemical transformation of phosphorus and phosphorus compounds.	15

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Contents : Unit	Topics	Contact Hours
2	**Microorganisms in aquatic ecosystem** The aquatic environment, Distribution of microorganisms in aquatic environment Physicochemical characteristics of water Importance and Productivity of aquatic ecosystem Pollution Problems, Sources and types of Pollutants Complex Biodegradable wastes- Pesticide pollution, oil pollution, Detergents Algal blooms and Eutrophication, Stratification Biodegradation	15
3	**Methods in environmental microbiology** Sources of contamination Microbial Indicators of Faecal Pollution-Coliforms as indicators Methods for detection of coliforms – IMViC test, Eijkman's test. Bacteriological Analysis of water Qualitative Analysis Quantitative Analysis Microorganisms as Nuisance Organisms Water borne Diseases Purification of Drinking Water	15
4	**Water and Wastewater Microbiology** Chemical and Microbiological Characteristics of wastewater BOD, COD, TOC Microbial evidence of water pollution Wastewater treatment processes and disposal; Primary treatment, Secondary treatment, Advanced treatment, Final treatment and solid processing Role of microorganisms in wastewater treatment processes	15
Total Hours		**60**

Textbook :

1 Introduction to Soil Microbiology, Alexander M, Wiley Eastern Ltd., 1977

2 General microbiology, Michael, M., M. John Stanier et al, Macmillan publications, 1999

References:

1 Microbiology, Microbiology, Joanne Willey, Linda Sherwood, Christopher J. Woolverton, McGraw-Hill, 2002

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	30.00	25.00	15.00	10.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

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Instructional Method:

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

1 https://water.usgs.gov/owq/FieldManual/Chapter7/NFMChap7_2_BOD.pdf

2 http://www.envexp.com/technical/method-downloads/cod-method-410

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