

Subject Code: 2SC2020303	Subject Title: Environmental Microbiology
COURSE TYPE: CORE COURSE	

Course Objective: Environmental Microbiology is a subject with great emphasis on environmental issues and risk assessment. Microorganisms and their use in environmental problem solving is at the core of this subject. Applications of microorganisms with different strategies of solving environmental issues will satisfy the thirst for curiosity of students

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	-	4	-	4	60	40	-	-	100

Unit	Content	Lectures	Weightage
1	Environmental monitoring and Bioremediation - Environmental monitoring: Sampling, physical chemical and biological analysis bioindicators, biomarkers, biosensors, - Methods for the analysis of microbial population in-situ, - Toxicity testing using organic material, - Environmental laws and policies in India Bioremediation - Bioremediation principles - Strategies and techniques of bioremediation: insitu and exsitu - Bioremediation of metals and other inorganic pollutants. - Phytoremediation - GMOs and their impact on bioremediations	15	25%
2	Water and wastewater microbiology - Characteristics and sampling of water and wastewater. Waste Treatment Processes: Suspended Growth Technology: Activated Sludge, Oxidation Ditches, Aerated Lagoons, Waste Stabilization ponds. Fixed Film Technology: Rotating Biological Contractor (RBC), trickling filters Packed-Bed Reactors, Waste stabilization ponds, Anaerobic Digestion Solid waste types and management.	15	25%
3	Biodegradation and bio deterioration Biodegradation ✓ Principles of biodegradation and mechanism of ✓ Biodegradation of detergent, pesticide, lignin, hydrocarbon and dyes Bio deterioration ✓ Principles and mechanisms of bio deterioration ✓ Methodology to assess bio deterioration ✓ Prevention and control of bio deterioration Bio deterioration of selected material	15	25%
4	- Air pollution, Formation and degradation of air pollutant - Global environmental Problems - Detoxification - Cometabolism - Bio magnifications of recalcitrant compounds - Biofuels	15	25%

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Learning Outcome: Students will principally learn the core aspects of Bio deterioration, Bioremediation, Biodegradation & Environmental problems and their monitoring.

Reference Books:

1. Wastewater treatment for pollution control, 2nd edition. *Arceivala*.
2. Environmental Microbiology. *R.M. Maier, I. L. Pepper & G.P. Gerba*.
3. Essentials of Ecology and Environmental Science, S V S Rana
4. Biodegradation and Bioremediation .Second edition, Martin Alexander
5. Environmental Biotechnology . Allan Scragg
6. Wastewater Engineering , Treatment and Reuse. Metcalf and Eddy
7. Wastewater Microbiology. Gabriel Bitton
8. Microbial Degradation and bioremediation. Surajit Das
9. Encyclopedia of Environmental Science and Engineering. Fifth edition .Pfafflin and Ziegler
10. Comprehensive Biotechnology Vol-4, *Murray Moo Young*.
11. Biotechnology. *Rehm and Reid*.
12. Industrial pollution Vol. I *E. Joe middle brooks*.
13. Wastewater treatment *M. N. Rao & A. K. Datta*
14. Water and water pollution handbook Vol. I, *Leonard, L. Ciaccio*.
15. Industrial pollution, *N. Iruving sax, Van Mostrand Rein hold company*.
16. Encyclopedia of environmental science & tech. Vol. II *Ram Kumar*.
17. Environmental engineering and management by S.K.Dhameja, Publ:Kataria&Sons
18. Microbial ecology by Bartha and Atlas, Pearson Edu
19. A text book of environmental chemistry& pollution control by S.S.Dara
20. Biotechnology by U. Satyanarayana
21. General Microbiology by Michael, M. M. John Stanieretal.
22. Experimental ecology by R.M.Atlas
23. Principles of Microbiology by RM.Atlas
24. Assessing Ecological Risks of BiotechnologybyLevR.Ginzburg
25. Environmental Biotechnology by B.C.Bhattacharyya and R.Banerjee
26. Environmental Science by S.C.Santra,Central, India
27. Environmental Microbiology–A Laboratory Manual by Pepperet. Al