Programme: M.Sc. (Microbiology)

Course Code: MIO 106

Title of the Course: ENVIRONMENTAL MICROBIOLOGY AND BIOREMEDIATION [T]

Number of Credits: 3

Effective from Academic Year: 2018-19

Prerequisites	It is assumed that the students have a basic knowledge of ecosystem structure and biogeochemical cycles (water, O,C,N,S,P)	
Objective:	This course develops concepts in Environmental Microbiology (microbial diversity, community structure and role of microorganisms in biogeochemical cycles, role of microorganisms in sustainable development and bioremediation of pollutants using microorganisms.	
Content:		
1.	**Microbial Ecology**	**(12)**
	Microbial community structure, evolution of communities Types of Ecosystems: components and functioning of ecosystem, concept of homeostasis, biotic and abiotic components in the environment and their interaction, characteristics and functions. Energy flow and material cycling. Food webs. Ecological succession. Ecological efficiency. Concepts of microcosms and econiches.	
	The expanse of microbial diversity, estimates of total number of species, measures and indices of diversity.	
2.	**Biogeochemical processes**	**(07)**
	Biogeochemical cycling of carbon, nitrogen, phosphorous, sulphur, Fe and Mn: physiological and biochemical aspects	
3.	**Concepts of sustainable and holistic development**	**(05)**
	Role of microorganisms in environment, Use of microorganisms towards sustainable development and specific pollution abatement programmes, need for environment impact assessment studies.	
4.	**Microbes on surface**	**(05)**
	Nature and significance, activity in surface films Biofilm kinetics and its application to waste water treatment	
5.	**Microbiological bioremediation**	**(07)**
	Bioremediation technologies. Overview of aerobic / anaerobic biodegradation and biotransformation of aliphatic, aromatic, xenobiotic and recalcitrant hydrocarbons. Methods of environmental monitoring and pollution control using nanotechnology.	
Pedagogy:	Lectures/tutorials/assignments/self-study	

References/ Readings	Scragg, A. H., Environmental Biotechnology, Longman Publishers.	
	Sharma, P. D., Environmental Microbiology, Alpha Science International.	
	Osborn, A. M. and Smith, C. J., Molecular Microbial Ecology, Taylor and Francis.	
	Liu, W-T. and Jansson, J. K., Environmental Molecular Microbiology, Caister Academic Press.	
	Norris, J. R. and Ribbons, D.W., Methods in Microbiology, Vol. 18 & 19, Academic Press	
	Murugesan, A. G. and Rajakumari, C., Environmental Science and Biotechnology: Theory and Techniques, MUP Publishers.	
Learning Outcomes	Understanding the significance of microorganisms in biogeochemical cycling of nutrients, sustainable development and bioremediation of pollutants for developing strategies of environmental conservation and remediation.	