

Programme: M.Sc. (Biochemistry)

Course Code: BCO 111

Title of the Course: BIOCHEMISTRY OF ENVIRONMENTAL POLLUTION AND REMEDIATION [T]

Number of Credits: 3

Effective from Academic Year: 2018-19

Prerequisites	It is assumed that the students have a basic knowledge of environment pollutants and biogeochemical cycles (water, O, C, N, S, P)	
Objective:	This course develops concepts in Environmental Pollution (Impact on air, water and soil), role of microorganisms in biogeochemical cycles and bioremediation of pollutants.	
Content:		
1.	Environment and Pollutants	(14)
	Environment: Atmosphere, soil, aquatic – fresh water, marine systems; biogeochemical cycles. Pollutants: classification, toxicity, synergistic or antagonistic action. Eco-toxicology: concept of permissible limits, ED50 & LD50; acute and chronic exposures; biochemical effects and genotoxicity. Monitoring of pollution using indicator microorganisms, biosensors: genetically modified organisms and enzymes Significance of dissolved oxygen, BOD, COD. Environment protection regulations, impact assessment and standards	
2.	Impact of environmental pollution	(14)
	Atmosphere Greenhouse gases and CFCs – sources and effect on the ozone layer; consequences; concept of carbon credit. Atmospheric particulate matter and smog – effect on respiratory system Elements such as asbestos, lead – toxicity and occupational hazards. Soil Xenobiotics, agricultural chemicals, improper waste disposal Hydrocarbons: petroleum and polynuclear aromatics such as naphthalene, benzo-pyrene, solvents, pesticides, lead and other heavy metals – significance on health. Aquatic – fresh water, marine systems. Discharge of industrial effluents such as mining, metals, pesticides, textiles, thermal waters, aquaculture, sewage; oil spills – impact on aquatic life and the food chain; consequences on human health.	
3.	Remediation of waste	(08)
	Treatment of waste Concepts of Reuse, Recycle, Recovery. Introduction: Waste water/ sewage treatment, Solid waste management, Hospital waste management	

	Bioremediation : Concept and technologies. Biological systems – plants, bacteria and fungi; microbial consortia. Microbial processes – enzymic transformations, co-metabolism, microbial adhesion, biofilms, production of extracellular polymers and emulsifiers. Removal of metal pollutants through sedimentation, sorption, precipitation, speciation conversion	
Pedagogy:	Lectures/ tutorials/ assignments/ students' seminars/ interactive learning/ self-study.	
References/ Readings	Dara, S.S., A text book of Environmental Chemistry and Pollution Control. S.Chand Publishers	
	E. Enger, E. D., Smith, B. E., Environmental Science: A study of Interrelationships, WCB publication, McGraw-Hill Higher Education.	
	Khopkar, S. M., Environmental Pollution Analysis. John Wiley & Sons.	
	Mitchell, R. & Cu, J. D., Environmental Microbiology Wiley-Blackwell Publication	
	Ramesh, K. V., Environmental Microbiology. MJP Publishers, India.	
	Maier, R., Pepper, I. & Gerba, C., Environmental Microbiology. Academic Press.	
	Moore J. W. & Moore, E. A., Environmental Chemistry. Elsevier.	
	Jadhav, H.V., Elements of Environmental Chemistry: For Undergraduate Science Students of Indian University. Himalaya Publishing House.	
	Satake, M., Sethi, S. & Egbal, S.A., Environmental Chemistry	
Learning Outcomes	Learning of impact of various environmental pollutants on air, water and soil, role of microorganisms in biogeochemical cycles and bioremediation of pollutants and the biochemistry of remediation mechanisms for developing further abatement strategies.	