

Name of the Programme: M. Sc. Zoology

Course Code: ZOO-623

Title of the Course: Ecotoxicology

Number of Credits: 02

Effective from AY: 2023-24

Pre-requisites for the Course:	Basic knowledge of Chemistry, Biology, Physiology and Ecology	
Course Objectives:	<ol style="list-style-type: none">1. To outline the toxicity of substances, their routes of exposure and fate in the body and the environment2. To classify the different types of toxicants based on their modes of action3. To summarize the various tests involved in ecotoxicity testing	
Content:	Module 1 Introduction to Ecotoxicology: Important concepts of ecotoxicology, Routes by which pollutants enter ecosystems; Major classes of pollutants (heavy metals, hydrocarbons, microplastics, etc), their sources and ecotoxicological effects. Effects of toxic substances and biomonitoring Acute and chronic toxicity, dose response, bioaccumulation, biomagnification, bioavailability, biodegradation; Toxicokinetics: Absorption, Distribution, Metabolism, Biotransformation and Elimination of Toxicants, Physiological and biochemical effects of toxic substances: Genotoxic, neurotoxic compounds, endocrine disruptors; Effects at the molecular level, cellular level, organism level (physiological, reproduction, behaviour)	15 hours
	Module 2 Ecotoxicity tests (lab-based and field tests) in air, water and soil, Use of model organisms for ecotoxicology: fish, helminthes, molluscs, mice, Environmental Risk Assessment Environmental bioindicators of ecotoxicity with faunistic studies Microbial Ecotoxicology: Interaction between microorganisms and pollutants; Role of microorganisms in detoxification and degradation of	15 hours

	<p>environmental pollutants</p> <p>Metagenomic techniques to study microbial diversity in polluted environment</p> <p>Biotechnology for mitigating environmental toxicity: Ameliorating nutrient toxicity (Nitrates and Phosphates), Handling sludge toxicity, Microbial and Phytoremediation (wetlands), Treatment of domestic wastewater using wetlands – a case study.</p>	
Pedagogy:	Lecture/ Group discussion/Presentations/ Field visit/project/self-study/Tutorials/Assignments	
References/ Readings:	<ol style="list-style-type: none"> 1. C.H. Walker, R.M. Sibly, S.P. Hopkin, and D.B. Peakall, Principles of Ecotoxicology, 4th ed. CRC Press, Taylor and Francis, 2012. 2. S.E. Jorgensen, Ecotoxicology: A derivative of encyclopedia of ecology. Academic Press, 2010. 3. F. Moriarty, Ecotoxicology: The study of pollutants in ecosystems. 3rd ed. Academic Press, 1999. 4. D. Peakall, Animal Biomarkers as Pollution Indicators. Chapman and Hall, 2012. 5. W.A. Hayes, Principles and Methods of Toxicology. CRC Press, Taylor and Francis, 2014. 6. M.M. Naik, and S.K. Dubey, Marine pollution and Microbial remediation. Springer, 2017. 7. C. Cravo-Laureau, C. Cagnon, R. Duran, and B. Lauga, Microbial Ecotoxicology. Springer, 2017. 8. A. Scragg, A. Environmental Biotechnology. Oxford University Press, 2005. 9. J.M. Willey, L.M. Sherwood, and C.J. Woolverton, Prescott's Microbiology. 10th ed. McGraw-hill Education, 2017. 10. C. Munn, Marine Microbiology: Ecology and applications. 3rd edition. Garland science, 2020. 11. T. Satyanarayana, B. Johri, and T. Anil, Microorganisms in Environmental Management. Springer, 2012. 	
Course Outcomes:	<p>The learner will</p> <ol style="list-style-type: none"> 1. Outline the routes of exposure and fates of toxic substances in the body and environment. 2. Categorize the sources and effects of various toxicants. 3. Assess the risk of toxicants in the environment. 4. Recommend solutions for mitigating toxicants in the environment. 	