



COURSE CURRICULUM

Course Title: Environmental Toxicology

Course Code:

Credit Units: 03

Course Level: PG

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
3	-	-	-	3

Course Objectives: The objectives of this course are to introduce the students to the nature and effects of toxic substances occurring in both natural and manmade environment. Thus, the risks resulting from the presence of such substances can objectively be assessed. Consequently, measures to prevent the substances reaching harmful levels or to minimize damage could be set.

Pre-requisites: The student should have basic knowledge of environmental aspects, pollution and health and biological principles.

Student Learning Outcomes: Upon completion of the course, the student should be able to:

- Define the fundamentals of toxicology and ecotoxicology.
- Describe the toxicology principles to the fate of toxicants and contaminants in the environment.
- Illustrate the biological impacts of toxins and contaminants on “organic life”.
- Be able to critically analyze, discuss, explain, and present current topics in environment contaminants
- Develop and compose case studies on ecotoxicological principles and testing
- Appraise and evaluate the complexity of toxicological issues and gain insight into the full breadth of the field of eco-toxicology

Course Contents/Syllabus:

	Weightage (%)
Module I : Principles of toxicology::	20
Descriptors/Topics Toxicity and ecotoxicity. The structure-activity and dose-response relationships of environmental toxicants; their absorption, distribution, metabolism, and excretion; and evaluation of their toxicity and factors that influence toxicity. Response to toxin exposures – Dose Response relationships	
Module II : Fate and transport of toxicants in environment:	20
Descriptors/Topics Toxic substances in the environment, their sources and entry routes, Eco-system influence on the fate and transport of toxicants; Transport of toxicants by air, water and soil; Transport through food chain - bio-transformation and bio-magnification, Metals, organic and inorganic contaminants and their fate in nature; Bioaccumulation & Ecology Impacts; mitigation of contamination, Case studies	
Module III : Classification of ecotoxicants	15
Descriptors/Topics Classification of environmental toxicants. Major types of toxic substances - degradable and non-degradable / xenobiotic chemicals; Drugs, Food additives, Industrial chemicals, Pesticides, Environmental pollutants, heavy metals, carcinogens, POP & VOCs.	
Module IV : Ecotoxicology and human exposure:	25
Descriptors/Topics Types of exposures, Routes of toxicants to human body – entry through inhalation, skin absorption, indigestion and injection; Absorption routes—skin, lung, gastro-intestinal tracts, Distribution storage of toxins in tissues, plasma protein, kidney, fat, bone and blood. Detoxification and Excretion: Effects of toxic substances : Health impacts- Target and non-target organ toxicity, hepatotoxicity, nephrotoxicity, neurotoxicity, respirotoxicity, Immunotoxicity, carcinogenicity, mutagenicity, system toxicity, genetic and reproductive toxicity.	
Module V : Toxicity Testing	20
Descriptors/Topics Lethal and sub-lethal doses; Analysis of NOEL, LD 50, LC 50,. Toxicity testing –acute toxicity tests, Sub-acute and chronic toxicity tests, Heavy metal toxicity tests. OECD guidelines of toxicity testing. Ecotoxicity tests (for eg: Soil Microorganisms: Nitrogen Transformation Test, Toxicokinetics, etc.) Case studies	

Pedagogy for Course Delivery: The course will be delivered with the help of presentations as well as traditional chalk and board lectures. Day to day examples and case studies will help understand the concepts well. The toxicological principles and metabolic functions will be dealt with the help of illustrations and examples.

Lab/ Practicals details, if applicable:

List of Experiments:

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100	0	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	Class test	Presentation	Assignment	Attendance	-
Weightage (%)	10	10	5	5	70

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment				End Term Examination		
Components (Drop down)	-	-	-	-	-	-	-
Weightage (%)	-	-	-	-	-	-	-

Text & References:

- C.H. Walker, S.P. Hopkin, R.M. Sibly, and D.B. Peakall, *Principles of Ecotoxicology*, 3rd ed., Taylor and Francis Ltd., Bristol, PA, 2006.
- C. Shaw and J. Chadwick; Taylor & Francis, *Principles of Environmental Toxicology*: Ltd. Bristol, PA, 1998.
- Annalee Yassi, Tord Kjellstrom, Theo de Kok, Tee Guidotti, *Basic Environmental Health*; Oxford University Press, USA, 2001.
- Edward J. Calabrese. *Air Toxics and Risk Assessment*, University of Massachusetts, Amherst, USA; Elaina Kenyon, CRC Press, March 25, 1991.
- Johann F. Moltmann and D.M. Rawson. *Applied Toxicology*, CRC Press; December 13, 1995
- Monroe T. Morgan. *Environmental Health* : Publisher: Wadsworth, Inc. Cover: Paperback.2003
- Koren H and Bisesi M. *Handbook of environmental health and safety: Principles and practices*. Volume II. Lewis Publishers: Tokyo 1996
- Manahan, S. E. *Fundamentals of Environmental Chemistry*. 2nd ed. CRC Press, Inc.,USA. 2001.
- Plunkett, E. R. *Industrial Toxicology*. 3rd ed. Edward Arnold (Australia) Pty. Ltd., Australia. 1987.
- Richards, I. S. *Principles and Practice of Toxicology in Public Health*. Jones and Bartlett Publishers, London. 2008.
- Seinfeld, J. H. and Pandis, S. N. *Atmospheric Chemistry and Physics*. John Wiley and Sons, Inc., USA. 2006.
- *Toxicology of insecticides*. Fumio Matsumura. Plenum Publishing Company Limited, 1985

Any other Study Material:

- Review articles
- Case studies