Environmental Toxicology and Risk Assessment

COURSE CODE : U24ES4E01

COURSE CREDIT: 02 (Theory)

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- 1. Understand the presence, types, and impact of toxic chemicals in different environmental compartments air, water, and soil.
- 2. Develop an understanding of environmental risk assessment methodologies and regulatory frameworks, including Life Cycle Assessment (LCA).

Course Outcomes:

CO1: Identify and describe the presence and behavior of toxic chemicals in air, water (freshwater, marine, groundwater, wastewater), and soil.

CO2: Apply the steps of environmental risk analysis and understand certification, risk matrices, and relevant legal frameworks.

Sr. No	Syllabus	No. of lectures	Credits
Unit-I: Chemicals in the Environment	Toxic chemicals in the air, Toxic elements in water – freshwater, marine water, ground water and wastewater, Toxic waste in soil, Impact of toxic chemicals on enzymes in living systems. Environmental episodes – Bhopal Gas Tragedy, Three Mile Island Disaster, Love Canal disaster, Minamata Disease, Itai Itai disease, Blue baby syndrome.	15	1
Unit II: Environmental Risk Assessment	Absorption, distribution and excretion of toxic agents, Acute and chronic toxicity, Bioassay and threshold limit value, Margin of safety, Therapeutic index Epidemiological issues – Fluorosis, Arsenicosis Principles of Biodegradation, Microbial Transformations – Biooxidations, Bio- reductions, Bio-hydrolysis Risk analysis – assessment and management, risk management certification, risk matrix, Air and water quality regulation, solid and toxic waste regulation, Life Cycle Assessment (LCA) of products.	15	1

References:

1. Advanced Environmental Chemistry. (2017). India: Energy and Resources Institute.

2. Casarett & Doull's Toxicology: The Basic Science of Poisons, 9th Edition. (2018). Greece: McGraw-Hill Education.

3. Ahluwalia, V. K. (2016). Environmental Studies: Basic concepts. India: Energy and Resources Institute.

4. Environmental Toxicology: Selected Entries from the Encyclopedia of Sustainability Science and Technology. (2012). United States: Springer New York.

5. Welbourn, P., Wright, D. A. (2002). Environmental toxicology. United Kingdom: Cambridge University Press.

6. A Handbook of Environmental Toxicology: Human Disorders and Ecotoxicology. (2020). United Kingdom: CABI.

7. Shaw, I., Chadwick, J. (2018). Principles of Environmental Toxicology. United Kingdom: CRC Press.

8. New Frontiers in Environmental Toxicology. (2021). Switzerland: Springer International Publishing.

9. Lerche, I., Glaesser, W. (2007). Environmental Risk Assessment: Quantitative Measures, Anthropogenic Influences, Human Impact. Germany: Springer Berlin Heidelberg.

10. Simon, T. (2019). Environmental Risk Assessment: A Toxicological Approach. United States: CRC Press.

11. Theodore, L., Dupont, R. R. (2012). Environmental Health and Hazard Risk Assessment: Principles and Calculations. United States: CRC Press