Course Code : ENCM 43654
Title : Environmental Toxicology and Risk Assessment
Pre-requisite : ENCM 31532
Co-requisite : none
Status : Compulsory, Theory cum practical

Learning outcomes:
After completion of the course unit, the student will be able to:

- critically discuss toxicological impacts of environmental contaminants on biota emphasizing health effects on humans,
- demonstrate competencies in specific techniques/tools used for assessing toxic effects of environmental contaminants, preparation of laboratory reports based on critical analysis of toxicological data in a scientific manner, and
- assess, evaluate and predict the human health risks and ecological health risks posed by environmental contaminants and hazardous situations for managing the environment.

Course content:
Introduction to Environmental Toxicology; Toxicokinetics and toxicodynamics; Absorption, distribution, accumulation and excretion of chemical contaminants and health effects on target tissue/organs; Metabolism of xenobiotics; phase 1 and phase 2 reactions; detoxification and bioactivation; Molecular mechanisms of toxic effects; Acute, and Chronic effects on organisms, long term effects: mutagenesis, carcinogenesis and teratogenesis; endocrine disruption; Environmental toxicology of selected groups of environmental contaminants: heavy metals, pesticides, polychlorinated biphenyls, dioxins and furans; cyanobacterial toxins; Environmental toxicology of engineered nano materials. Evaluation of acute and chronic toxicity, bioassays and biomarkers; Radiation and health risks; Occupational safety and health risks.
Major elements of Risk assessment: hazard identification, exposure assessment, dose response assessment and risk characterization; Techniques and tools in human health risk assessment, Techniques and tools in ecological health risk assessment; probabilistic risk assessment methods, assessment factor methods, assessment of relative risks, Radiation risk assessment. Prospective and retrospective risk assessments; formulation of environmental quality standards based on risk assessments, Risk management and risk communication.
Practical sessions on: Evaluation of toxic effects of selected environmental contaminants; Bioassays and estimation of toxicity thresholds; Applications of risk assessment methodologies, prediction of hazardous concentrations and species protection levels based on species sensitivity distribution analysis.

Method of teaching and learning:
A combination of lectures, laboratory studies and preparation of scientific reports, computer based learning, assignments, seminars and small group discussions.

Assessment Strategy: Continuous assessment and end of semester examination. Percentage given for each sub component indicates the percent contribution to the final marks.

Continuous Assessment 30 %		Final Assessment 70 %		
Details:		Theory	Practical	Other
Lab reports and computer based practical reports	15	70	-	-
Individual Presentations	10			
Individual assignments	05			

Recommended reading:

1. Landis, W. G., R. M. Sofield & M. Yu (2011). Introduction to Environmental Toxicology. CRC Press Boca Raton, Florida.
2. Klaassen, C. D., L.J. Cassarett & J. Doull (2013). Toxicology – The Basic Science of Poisons. 8th Edition. McGrew Hill.
3. Newman, M.C. (2010) Fundamentals of Ecotoxicology. 3rd Edition. CRC Press, New York.
4. Wright, D. A. & P. Welbourne (2002). Environmental Toxicology. Cambridge University Press.