Course Focusing on Environment and Sustainability

Sem.	Course Code	Elective II: Biochemical and Environmental Toxicology	Total Marks: 100		Hours / Week	Credits
II	21PBFET206		CIA: 50	ESE: 50	5	4

Course Objectives:

1. To understand the basic concepts of toxicology.
2. To understand the relationship between exposure, hazards and development of disease.
3. To assess risk factors associated with exposure to toxic chemicals

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Design strategies for study the of dose-response relations.	K1 - K4
CO 2	Critically evaluate different advanced exposure assessment methods.	
CO 3	Analyze the effects of different types of Hazardous pollutants.	
CO 4	Clearly understand the mechanisms and mode of action of different toxic agents.	
CO 5	Gain knowledge about utilizing microbes and natural agents for Bioremediation and Detoxification purposes.	

K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I

General principles of Toxicology: Definition, Sources of environmental toxicants, Classification of toxicants. Evaluation of Toxicity – Acute Toxicity, Chronic Toxicity, Lethal Concentration (LC), Lethal Dose (LD), Lethal Time (LT), Effective Concentration (EC), Effective Dose (ED), Knockdown Dose (KD), Knockdown Time (KT), Medium Tolerance Limit (TLm) – Definitions only. Dose response relationship. Factors affecting action of Toxicants. Biomarkers of Toxicity.

Unit - II

Biotransformation: Routes of exposure of Toxicants. Absorption, Distribution, Accumulation, Biotransformation (Phase I and Phase II reactions) and Elimination. Bioavailability – Area under curve.

Toxicity Testing – Invivo (Acute, Subchronic and Chronic toxicity test) and Invitro Test (Prokaryotic and Eukaryotic mutagenicity test, DNA Damage and Repair).

Unit - III

Metal poisoning – Definition, Types. Toxic mechanism and sites of action of Mercury, Lead, Chromium, Cadmium and Fluoride.

Hazardous pollutants – Characteristics and Categories (Plastics and Medical wastes).

Toxicity of pesticides – Persistent and Degradable pesticides with examples - Bioconcentration and Biomagnification.

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Unit - IV
Action of Toxicants: Teratogenesis - Causes, Mode of action and Evaluation (Examination of Pregnant animals and Fetus). Carcinogenesis - Causes, Mode of action and Evaluation (Biochemical markers). Mutagenesis - Causes, Mode of action and Evaluation (Ame`s test). **Organ Toxicity** **Hepatotoxicity** – Hepatotoxicants (Carbon tetrachloride) and its mechanism **Neurotoxicity** – Structural effects of toxicants on neurons, Toxicant mediated alteration in synaptic junction.
Unit - V
Bioremediation: Insitu and Exsitu Bioremediation. Phytoremediation. Bioabsorption of metals by bacteria, fungi and actinomycetes (with one example). **Natural therapies to promote detoxification** – Antioxidants: Vitamin A, Vitamin C, Vitamin E and Phenolics, Glutathione. Detoxifying agents: Alfalfa, Chlorella. Protective agents: SAM, Silibinin.

Skill Development Activities	Max. Marks (10)
Assignment	3
e-Content Presentation	3
Case Study	3
Punctuality	1

TEXT BOOKS	
1	M.A.Subramanian, Toxicology Principles and Methods, MJP Publishers, 2nd edition, 2019
2	Vijayan Kannampilly, Toxicology, Rajat Publications, 2009
REFERENCE BOOKS	
1	Curtis D Klaassen Ph.D (Editor) Casarette and Doull's, Toxicology - The Basic Science of Poison, Mc Graw-Hill Medical Publishing division, 7th Edition, 2008
2	Bruce E. Rittmann and Perry L.McCaryty, Environmental Biotechnology - Principles and applications.
3	Indu Shekhar Thakur. Environmental Biotechnology: Basic concepts and applications. McGraw-Hill Education, 2001
4	Ernest Hodgson Ph.D (Editor) AText Book of Modern Toxicology, A John Wiley and Sons Inc Publication, 3rd Edition 2010.

WEB RESOURCES	
1	https://www.mlsu.ac.in/econtents/49_CLASSIFICATION%20OF%20TOXICANTS.pdf
2	https://www.biologydiscussion.com/biochemistry/food-toxicants/classification-of-toxicants-present-in-food-biochemistry/44020
3	http://www.rnlkwc.ac.in/pdf/study-material/zoology/UG%20VI%20teratogenesis.pdf

Course Designed By	Verified By	Approved By HOD
Mrs. T. RADHA	Mr. R. RASU	Dr. A. K. VIDYA

QUESTION PAPER PATTERN

Time: 3 hours		Max. Marks: 50
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer	**SECTION-B (5 X 3 = 15 Marks)** Answer ALL the questions Either or type Two questions from each unit	**SECTION-C (5 X 5 = 25 Marks)** Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study

Mapping of COs with POs and PSOs:

PO/PSO / CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	M	S	S	S	S	S	S	S	S	S
CO 3	S	M	S	M	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	S	S	S	S	S	S	S	S
CO 5	S	M	M	M	S	S	S	S	S	S	M	S

S - Strong, M - Medium, L - Low

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