

Sem.	Course Code	ELECTIVE PAPER III BIOCHEMICAL AND ENVIRONMENTAL TOXICOLOGY	Total Marks: 100		Hours Per Week	Credits
III	17PBFET307			CIA: 25	ESE: 75	4

Objective(s):

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

Course Outcome:

On successful completion of the course students will be able to:

CO1 - Design strategies for study the of dose-response relations.

CO2 - Critically evaluate different advanced exposure assessment methods.

CO3 - Analyze the effects of different types of Hazardous pollutants.

CO4 - Clearly understand the mechanisms and mode of action of different toxic agents.

CO5 - Gain knowledge about utilizing microbes and natural agents for Bioremediation and Detoxification purposes.

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 – In vivo (Acute, Subchronic and Chronic toxicity test) and In vitro 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.

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.

Text Books

1. M.A.Subramanian, Toxicology Principles and Methods, MJP Publishers, 2004.
2. Vijayan Kannampilly, Toxicology, Rajat Publications, 2009.

Reference Books:

1. Curtis D Klaassen Ph.D (Editor) Casarett and Doull's Toxicology The Basic Science of Poison . Mc Graw-Hill Medical Publishing division, Seventh Edition 2008.
2. Environmental Biotechnology Principles and applications, Bruce E. Rittmann and Perry L. McCarty.
3. Environmental Biotechnology: Basic concepts and applications, Indu Shekhar Thakur.
4. Ernest Hodgson, Ph.D (Editor) A Text Book of Modern Toxicology, A John Willey and Sons. Inc Publications, Fourth Edition 2010.

QUESTION PAPER PATTERN		
SECTION - A	SECTION - B	SECTION - C
10 x 1 = 10 Marks (Multiple Choice, Four options) Two questions from each unit	5 x 7 = 35 Marks (Either or choice) Two questions from each unit	3 x 10 = 30 Marks (Answer any three Questions) One Question from each unit