

DISCIPLINE SPECIFIC CORE COURSE- 18 (BIOMED-DSC-18) TOXICOLOGY**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)	Department offering the course
		Lecture	Tutorial	Practical / Practice			
Toxicology BIOMED-DSC-18	4	3	-	1	Class XII Passed	Basic Knowledge of Pharmacology	Biomedical Science

Learning objective

- The present course content is designed to provide the basics of toxicology. The course would help to understand the influence of toxic substances on various body organs. It provides insight into measurement of toxicity, principles of exposure, molecular mechanism of toxicity and toxicants that harm our environment.
- Relevant importance has been given to those topics which can build a strong foundation in the subject, based on which, facts can be assimilated during subsequent higher studies.

Learning outcomes

- Familiarity with the form of toxicology practiced during antiquities across the world; and how the modern form of toxicology emerged. Nature of toxic substances and how humans are exposed to them. Spectrum of toxic responses. Types of toxicity and factors affecting the toxicity by a chemical.
- Basics methods and biological parameters used to measure toxicity of a chemical. General mechanisms whereby toxicants cause toxicity; interaction of toxicants with target bio-molecules in the body and resultant toxicity. Basics of safety evaluation of toxicants.
- Mechanisms/processes involved in absorption, transport, chemical modification and excretion of toxicants from the body.
- Through examples of few common classes of toxicants such as pesticides and metals, students are able to learn; how humans are exposed to them, their mechanism of action and symptoms of toxicity.
- The process by which certain anthropogenic chemicals cause harm to wildlife/ ecosystem.

- Basics of management, clinical evaluation of toxic patients, methods used to prevent further toxicity, and use of antidotes.

SYLLABUS OF BIOMED-DSC-18

Unit-I: Introduction

(07hrs)

Brief history, Different areas of modern toxicology, Classification of toxic substances, various definitions of toxicological significance, characteristic and types of toxic responses and tolerance to toxicants.

Unit-II: Toxic exposure, response, evaluation of toxicity and mechanism of toxicity

(14hrs)

Effect of duration, frequency, route and site of exposure of xenobiotics on its toxicity, various types of dose response relationships, assumptions in deriving dose response, LD50, LC50, TD50, NOAEL, ADI, MOE and therapeutic index. Concept of ultimate toxicant, general mechanisms by which various toxicants cause toxicity (up to molecular and cellular level).

Unit-III: Fate of xenobiotics in human body

(12 hrs)

Absorption, distribution, excretion and metabolism of xenobiotics (biotransformation, Phase-I reactions including oxidations, hydrolysis, reductions and phase II conjugation reactions). Toxic insult to liver, its susceptibility to toxicants with reference to any two hepatotoxicants.

Unit-IV: Toxic agents

(06hrs)

Human exposure, mechanism of action and resultant toxicities of the following xenobiotics: Metals: lead, arsenic; Pesticides: organophosphates, bipyridyl compounds and anticoagulant pesticides.

Unit-V: Eco-toxicology

(02hrs)

Brief introduction to avian and aquatic toxicology, movement and effect of toxic compounds in food chain (DDT, mercury), concept of bio-accumulation, bio-magnification.

Unit-VI: Clinical toxicology

(04hrs)

Management of poisoned patients, clinical methods to decrease absorption and enhance excretion of toxicants from the body, use of antidotes.

Practical

(30 hrs)

(Wherever wet lab experiments are not possible, the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

1. Separation of a mixture of benzoic acid, beta- naphthol and naphthalene by solvent extraction and
2. Identification of their functional Groups.
3. Determination of Dissolved oxygen (DO) using Winkler method.
4. Determination of Biological oxygen demand (BOD) of water.
5. To perform quantitative estimation of residual chlorine in water samples.
6. To determine the total hardness of water by complexo-metric method using EDTA.
7. To determine acid value of the given oil sample.
8. To estimate formaldehyde content of given sample.
9. Calculation of LD50 value of an insecticide from the data provided.
10. Determination of COD (chemical oxygen demand) of the given water sample.

Essential reading

- Klaassen, C.D and Watkins, J.B. (2021). 4th Edition. *Casarett and Doull's Essentials of Toxicology*. McGraw Hill, ISBN-13: .1260452297-978
- Klaassen, C.D. (2018). 9th Edition. *Casarett and Doull's Toxicology, The Basic Science of the Poisons*. McGraw Hill. ISBN-13: 978-1259863745.

Suggestive readings

- Stine, K.E. and Brown T.M (2015). 3rd Edition. *Principles of Toxicology*. Florida, USA: CRC Press. ISBN-13: 9781466503434.
- Timbrell. J. (2001). 3rd Edition. *Introduction to Toxicology*. CRC Press. ISBN-13: 978-0415247634.