DISCIPLINE SPECIFIC ELECTIVES (DSE-16): Toxicology
Zoo-DSE-16

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibilitycriteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Toxicology Zoo-DSE- 16	**04**	**03**	**Nil**	**01**	**Passed Class XII with Biology/ Biotechnology**	**NIL**

Learning Objectives

The learning objectives of this course are as follows:

- to gain insight about basic toxicology, nature and classification of toxins and its mechanism.
- to learn about daily exposure types, dose response curve and toxicity episodes of toxic substances.
- to understand the chemistry, kinetics, metabolism and excretion of toxins.
- to enable the students to understand the aspects of environmental, medical and forensic toxicology.
- to elucidate the role of instruments and techniques in studying toxicology.

Learning Outcomes

By studying this course, students will be able to:

- acquire in-depth knowledge of the principles of toxicology, exposure and dose-response assessment.
- use technical and analytical skills to quantify the level and effect of xenobiotics on environment.
- better understand the mechanism of action and effects of toxic chemicals at multiple levels of biological organization.
- identify relationship between chemical exposure and its effect on physiological system.
- perform, analyse and interpret technical aspects and experimental approaches for toxicological research testing and risk assessment.

SYLLABUS OF DSE- 16

UNIT- 1: Principles of Toxicology **8 hrs**

History and scope of toxicology, nature and classification of toxins, mechanism of toxicity, risk assessment-animal bioassays, dose-response assessment.

UNIT- 2: Toxicokinetics: 10 hrs

Transportation, absorption, distribution, metabolism and excretion of toxins, enzyme mediated biotransformation (hydrolysis, reduction, oxidation, conjugation), and toxicokinetics (one-and two-compartment, elimination, clearance, saturation).

UNIT-3: Applied Toxicology 20 hrs

Environmental Toxicology: Ecotoxicology, Food, Agrochemical and Industrial Toxicology- Fertilizers and pesticide toxicology, Heavy metal toxicity, solvent & vapors toxicity, radiation/ radioactive toxicity.

Medical, and Forensic Toxicology: Organ's responses to toxins (pulmonary, hepatic, renal, cerebral, cardiac-blood vascular, nervous system, organs of immune system, ocular, dermal, reproductive and endocrine systems) toxicity, Poisons: definition, classification of poisons, types of poisoning, mode of action, antidotes & factors modifying the action of poisons, Nanotoxicology, Carcinogens, Immunotoxicity (immune modulation, xenobiotic-inducedhypersensitivity & autoimmunity).

Developmental and Occupational Toxicity: Dosemetrics, Dysmorphogenesis, maternal & environmental effects on fetus, workplaces, associated agents, routes and span of exposures and standards, dose determination, diseases/ ailments, risk evaluation.

UNIT- 4: Tools and Techniques in Toxicology: 4 hrs

Instruments (Chromatography- TLC, GLC, HPLC), Soxhlet apparatus, flash evaporator, Lyophilization

UNIT- 5: Regulatory Units 3 hrs

Role of institutes *viz.* EPA (Environmental Protection Agency), TERI, CSE (Center for science and environment) and CPCB, FAO, European union norms etc.

Practical (30 hrs)

(Laboratory periods: 15 classes of 2 hours each)

1. Determination of the LD_{50} /LC_{50} with the help of data.
2. Minimum inhibitory concentration of a toxin/ pesticide/ heavy metal/ tobacco.
3. Effect of a toxin/ pesticide/ heavy metal on any live organism (microbes/ animal/ plants).
4. Comparative study of normal and intoxicated sections of organs with the help of permanent slides/ pictorial representation (pulmonary, hepatic, renal, cerebral, cardiac-blood vascular, nervous system, organs of immune system, ocular, dermal, reproductive and endocrine systems - any three organs).
5. Separating techniques for toxin/s- Chromatography: Paper/ Thin Layer/ Column.
6. Techniques of HPLC, GLC (Dry Lab).
7. Routes of administration of drugs for the treatment regimens (Dry Lab).

8. Project work based on visit to institute of toxicology/ forensic science/ public health/ laboratory /hospital.

Essential/recommended readings

1. Woolley, D. and Woolley, A. (2017). Practical Toxicology- Evaluation, Prediction and Risk, Third edition, CRC press, Taylor and Francis Group/
2. Stine, K. E. and Brown, T. M. (2015). Principles of Toxicology, Third edition, CRC press, Taylor and Francis Group
3. Hayes, W. and Kruger, C. L. (2014). Hayes' Principles and Methods of Toxicology, VI edition, CRC press, Taylor and Francis Group.
4. Eroschenko, V. P. (2008), De Fiore's Atlas of Human Histology with functional correlations, Eleventh edition, Wolter Kluwer, Lippincott William and Wilkins.
5. Tortora, G.J. & Grabowski, S (2006) Principles of Anatomy & Physiology, XI edition. John Wiley & Sons.

Suggestive readings

1. Pani, B (2019). Textbook of Toxicology, Dreamtech press.
2. Gad, S. C. (2018). Regulatory Toxicology, III edition, CRC press, Taylor and Francis Group.
3. Casarett & Doull's Essentials of Toxicology (2015), III Edition, A & L Lange Series.
5. Pandey, G. and Sahni, Y. (2013) Toxicology Laboratory manual. International E-Publication.
6. Freifelder, D. (1999). Physical Biochemistry: Applications to Biochemistry and Molecular Biology, Second Edition, W. H. Freeman and Company.

NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.