Course Code: ZOO 338 **Course Title: Toxicology**
Number of Credits: 3+ 1
Effective from AY: 2020 -21

Prerequisite for the Course:	Basic knowledge on Anatomy, Physiology and Ecology.	
Objectives:	1. To understand everyday toxic substances and their routes of exposures and its fate in the animal body and in the environment. 2. To understand significance of toxicological studies in forensic science.	
Content:	**Module 1** Introduction to toxicology: Definition and Scope, History of Toxicology, Branches of Toxicology. Classification of Toxicants (based on 1] Source, 2] Use, 3] Target organ 4] Reactivity).	4Hrs
	Toxicokinetics: Definitions and concepts of Exposure, Dose and response. Metabolism of toxicants (Phase I and Phase II reactions), Absorption, Distribution, Biotransformation and Elimination of Toxicants (Renal Elimination, Hepatic Elimination, Respiratory Elimination), Toxic actions /mechanism (Acute, Sub-chronic & Chronic). Toxicokinetic models (Descriptive and Physiological Models).	8 Hrs
	Module 2: Environmental Toxicity: Environmental contaminants, Dilution paradigm and Boomerang paradigm, Ways of poisoning food chain, Environmental persistence.	4 Hrs
	Pollution: Air pollution, Noise pollution, water pollution and thermal pollution: types and sources, effects of pollutants on human health. Solid waste pollution: sources and effects of solid waste toxicity on human health.	4 Hrs
	Pesticide and Heavy metal toxicity: effects of pesticides and heavy metals on ecosystem, mechanism of pesticides toxicity, heavy metal toxicity and their effects on human health	4 Hrs
	Module 3 Forensic toxicology: Disciplines of Forensic toxicology (Definition of poisons, Forensic classification of poison, factors affecting the mode of action of poisons, extraction and isolation of poisons from biological samples. Drugs included in routine post-mortem toxicology, Forensic DNA typing system. Applications of forensic toxicology	6Hr
	Alkaloid toxicity: definition, classification and isolation of alkaloids from biological samples, general properties of toxic alkaloids.	3 Hrs
	Food poisoning- definition and common sources. Analysis of Milk and milk products for adulterants by physical, chemical and instrumental techniques.	3 Hrs
	Module 4: Practicals Determination of alcohol in blood and urine sample.	12 x 2 Hrs

	Determination of barbiturate by UV -visible Spectrophotometric method. Extraction of drugs from hair sample. Determination of a drug in urine by visible / UV Spectrophotometry Determination of LD50 from given data using Probit analysis. *In Vitro* Cytotoxicity test using XTT/MTT assays and cell cultures. Effect of heavy metal pollution in the osmoregulatory process in crabs/fishes	
Pedagogy:	Lectures/Tutorials/Videos/Assignments/ Group discussions/Self-study.	
Learning Outcome:	1. Understanding the significance of toxicology and to distinguish the different toxic materials. 2. Understanding application of different routes of exposure for toxicological studies and dose findings. 3. Understanding of the physiological and environmental effects of toxins. 4. Knowledge of various techniques for Toxicity evaluation.	
References /Reading:	1. Timbrell J. Introduction to ToxicologyThird Edition (2002), Taylor and Francis Inc. 2. Klaassen C, John Watkins J. Casarett & Doull's Essentials of Toxicology, Third Edition (2015). McGraw-Hill Education publication. 3. Stine K., Brown TM. Principles of Toxicology. Third Edition (2015). CRC Press. 4. Wallace A H. Principles and Methods of Toxicology. Fifth edition (2007). Informa Healthcare Publication, USA 5. Kwong T, Magnani B, Rosano T,Shaw L. The Clinical Toxicology Laboratory: Contemporary Practice of Poisoning Evaluation, Second Edition (2013). AACC Press. 6. Pandey G, Sahani YP. Toxicological Laboratory Manual. First Edition (2013)International E-Publication, India. 7. Levine B. Principles of Forensic Toxicology. Second Edition (2003)Amer Assn for Clinical Chemistry Press. 8. Hodgson E. A Textbook of Modern Toxicology. Fourth Edition (2010). Willey Publication. 9. Durrant M. Handbook of Clinical Toxicology. First Edition (2019). Hayle Medical Publishers.	