

Course Code	Course Title	L	T	P	C
BABIT406	Toxicology	3	1	0	4
Pre-requisite	BABIT101 - Biochemistry	Syllabus Version			
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Course Objectives					
1. Understanding the principles, classification, and mechanisms of toxicants, along with their metabolic and molecular interactions in biological systems					
2. Examining the ecological impacts of toxicants, including biodegradation and biomagnification, as well as exploring genotoxicity testing and biotechnological applications like biosensors and bioremediation					
3. Learning about toxicological risk assessment, regulatory frameworks, and ethical responsibilities in toxicology research					
Course Outcomes					
1. Explain key toxicological concepts and classify toxicants based on their source, impact, and mechanism of action.					
2. Demonstrate an understanding of ADME (Absorption, Distribution, Metabolism, Excretion) processes and molecular mechanisms associated with toxicant effects.					
3. The environmental fate of toxicants and evaluate their effects on ecosystems using ecotoxicological knowledge					
4. Gain proficiency in conducting toxicity assays such as LD50 determination, Ames tests, and heavy metal detection					
5. Apply toxicological principles to biotechnological innovations and critically analyze case studies to address real-world toxicological challenges					
Module:1	Fundamentals of Toxicology	9 hours			
Definition and Scope of Toxicology. Types of Toxicants: Natural and synthetic. Dose-Response Relationships: Threshold, potency, and efficacy. Routes of Exposure: Inhalation, ingestion, dermal absorption.					
Module:2	Toxicant Metabolism and Molecular Mechanisms	9 hours			
Absorption, Distribution, Metabolism, and Excretion (ADME) of toxicants. Biotransformation: Phase I and Phase II reactions. Molecular Mechanisms of Toxicity: Oxidative stress and cellular damage. Repair Mechanisms in Cells: DNA repair, protein folding.					
Module:3	Environmental and Ecotoxicology	9 hours			
Environmental Pollutants: Heavy metals, pesticides, and industrial chemicals. Concepts of Biodegradation and Biomagnification. Ecotoxicological Effects: Impact on flora, fauna, and human health. Environmental Monitoring Techniques in Biotechnology.					
Module:4	Genetic and Molecular Toxicology	9 hours			

Genotoxicity and Mutagenicity: Causes and implications. Tests for Genotoxicity: Ames test, comet assay. Impact of Toxicants on DNA and RNA. Applications of Biotechnology in Toxicology: Bioremediation and biosensors.		
Module:5	Applied and Regulatory Toxicology	9 hours
Pharmacogenomics and Toxicology: Role in personalized medicine. Toxicological Risk Assessment: Hazard identification and exposure assessment. Regulatory Guidelines: WHO, FDA, and international standards. Ethics and Biosafety in Toxicology Research.		
Module:6	Contemporary Topics	2 hours
Guest lectures and/or a visit to the Toxicological Institute will be organized		
Total Lecture Hours:		47 hours
Tutorial Hours:		15 hours
Text Book(s)		
Curtis D. Klaassen. , " Casarett & Doull's Toxicology: The Basic Science of Poisons ", McGraw Hill Education, 9 th Edition, 2018 A. Wallace Hayes, " Principles and Methods of Toxicology ", CRC Press, 6 th Edition, 2015		
Reference Books		
Ernest Hodgson, " Textbook of Modern Toxicology ", Wiley, 4 th Edition, 2015 Michael J. Derelanko and Carol S. Auletta, " Handbook of Toxicology ", CRC Press, 3 rd Edition, 2015		
Mode of Evaluation :Continuous Assessment Test, Digital Assignment, Quiz, Final Assessment Test, Seminar, Presentaion		
Recommended by Board of Studies :		26-05-2025
Approved by Academic Council : No. 78		12-06-2025