

Course Title	TOXICOLOGY				
Course Code	PHA408				
Course Type	Compulsory				
Level	BSc (Level 1)/ MPharm (Level 2)				
Year / Semester	4 th year, 8 th semester				
Teacher's Name	Dr. Panagiotis Theodosios-Nompelos				
ECTS	6	Lectures / week	3	Laboratories/week	2
Course Purpose	<p>The aim of this course is to introduce students to the different fields of Toxicology, e.g. Clinical, Experimental, Forensic, Industrial, Occupational, Environmental and Analytical Toxicology and to teach to them the main causes of poisoning, the mechanism of toxic action, the symptoms and the ways of treating intoxicated humans as well as the analytical methods used to detect toxic substances in biological samples and other specimens. Further aims of the course are the understanding of the use of antidotes and their mode of action, as well as the mechanisms of genotoxicity, mutagenesis and teratogenesis caused by toxic agents. The course also aims to teach the detecting methods for various toxic agents in biological samples of humans, the environment, food, beverages, applying proper qualitative and quantitative analytical techniques used in Toxicology. The course offers the knowledge required to pharmacy professionals in order to be able to: a) obtain the knowledge for pharmaceutical care in order to be able to advise patients under medical treatment for therapeutic efficacy and safety b) recognise clinical symptoms caused by several toxicants c) contribute to clinical cases due to acute or chronic intoxications caused by drug overdose or poisons, d) assist to state authorities for the investigation of forensic cases e.g identification of the cause of death due to toxic agents or drugs.</p>				
Learning Outcomes	<p>By the end of this course, the students should be able to:</p> <ul style="list-style-type: none"> • State the various branches of toxicology and their objectives; • Identify the symptoms of poisoning by the commonest toxic agents, drugs and compounds of pharmaceutical interest; • Recognise the molecular and biochemical mechanisms of toxicity from poisons and the clinical aspects of it; • Distinguish the general and specific antidotes for common poisons and the mechanism of their action; • Analyse the mechanism of the toxic action of the various chemicals and drugs, and the ways of treatment; • Analyse dangers evolving from environmental pollution 				

	<ul style="list-style-type: none"> Distinguish about sampling and toxicological analysis for the detection of the poison, that caused the toxic action, in biological samples and other specimens (e.g. food); 		
Prerequisites	PHA 309	Corequisites	None
Course Content	<p>Theory:</p> <ul style="list-style-type: none"> Introduction to Toxicology Classification of toxic agents Toxicokinetics (absorption, distribution, biotransformation, excretion). Biotransformation of drugs (detoxification and bioactivation) Target organ toxicity, symptoms of poisoning in various tissues and organs. Genotoxic agents, teratogenesis, mutagenesis, fetal toxicity Toxicity testing in Experimental Toxicology Clinical Toxicology (treatment strategy of intoxications, toxic drug interactions, antidotes and mechanisms of their action) Study of special classes of toxic agents and the toxic effects caused from them (heavy metals, organic solvents and vapors, alcohols, agrochemicals and pesticides, environmental pollutants, drugs, psychotropic agents and street drugs) Food poisoning Environmental Toxicology Analytical Toxicology (biological sampling, detection of poisons and their metabolites by classical and by instrumental analytical techniques) and its contribution to forensic and clinical cases <p>Laboratory experiments/exercises:</p> <p>As part of the course, laboratory exercises and case studies are carried out on the course material for a better deepening and consolidation of the theoretical part. Indicative exercises cover the toxicological interpretation of pharmaceutical compounds and drugs including isolation. Examples are:</p> <ol style="list-style-type: none"> Toxicity of organic solvents and identification of halogenated hydrocarbons in solutions. <i>In silico</i> prediction of drug toxicity (with Protox and Lazar programs). Identification of lead in aqueous solutions and prediction of possible toxicity. Identification of Alkaloids and tobacco products. Identification of salicylates in biological fluids. Identification of paracetamole in biological fluids. 		
Teaching Methodology	The teaching methodology includes:		

	<p>A) lectures, with power point presentations, for the understanding of the theoretical background of the lesson. The lectures also include case studies with regard to their toxicological analysis as well as the advantages and disadvantages of various analytical methods used. Power Point detailed notes are used, including tutorials and case studies. To enhance student's participation, discussion between them, questions/answers and debates are encouraged.</p> <p>B) laboratory work/experiments for understanding the basic principles of toxicological analysis for the detection of toxic agents in different specimens.</p>
Bibliography	<p>(a) <u>Textbooks:</u></p> <ol style="list-style-type: none"> 1. Casarett & Doull's, Essentials of Toxicology (2nd edition), Greek translation, Authors: Curtis D. Klaassen, John B. Watkins, 2015, Editor: Parisianos A.E. 2. Casarett & Doull's, Essentials of Toxicology (3rd edition), Curtis D. Klaassen, John B. Watkins, 2015, The McGraw-Hill Companies. 3. Casarett & Doull's Toxicology: The Basic Science of Poisons (9th Edition), Curtis D. Klaassen, 2018, The McGraw-Hill Companies. 4. Lecturer's notes from Power Point class presentations <p>(b) <u>References:</u></p> <ol style="list-style-type: none"> 1. A Textbook of Modern Toxicology", E. Hodgson, Wiley, 4th edition, 2010 2. Pharmaceutical Toxicology. G.J. Mulder, L. Dencker, Pharmaceutical Press, 2006
Assessment	<p>Final Examinations 50%; Course work 50% (Midterm exam 30%, Laboratory work/exams 20%).</p> <p>Course evaluation includes the following:</p> <p>(a) a written examination during the semester which includes specific modules of the course and it accounts for 30% of the total grade</p> <p>(b) laboratory reports during the semester, in which students present the collected and analysed experimental data as well as their conclusions, derived from theory and the experimental data. Together with lab written exams on the laboratory work, lab reports account for a total of 20% of the total score (60% of this concerns the laboratory reports and 40% the exam results)</p> <p>(c) a final written examination which includes all modules of the course material and it accounts for 50% of the total grade.</p> <p>Students are prepared for the above written exams over the theoretical and practical background in the classroom and with additional exercises given to</p>

	<p>them for further practice. For the better comprehension of the subject frequent revisions are performed at regular intervals.</p> <p>Questions of gradual difficulty apply to the evaluation of the mid-term and final examination. There may be multiple choice or right/wrong questions with justification of the answers or issue analysis and problem solving questions may be applied in order to evaluate the knowledge and perception of the student on the subject.</p> <p>For the evaluation of laboratory exercise reports, the following criteria shall be taken into account, with ratios varying according to the laboratory exercise:</p> <ul style="list-style-type: none"> (a) data collection (b) data analysis (c) application of theory to draw conclusions <p>The above criteria and assessment tools, as well as their weight, are communicated to the students, and are formulated in such a way in order to maximize the expected learning outcomes as well as the quality of the course.</p>
Language	Greek and English