

COURSE OF STUDY - Pharmaceutical chemistry and technology

ACADEMIC YEAR 2023-2024

ACADEMIC SUBJECT – *EXPERIMENTAL PHARMACOLOGY AND TOXICOLOGY*

General information	
Year of the course	4 th
Academic calendar (starting and ending date)	2 nd semester
Credits (CFU/ETCS):	7
SSD	B10/14 - PHARMACOLOGY
Language	ITA
Mode of attendance	Mandatory Attendance

Professor / Lecturer	
Name and Surname	Elena Conte
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Telephone	
Department and address	Department of Pharmacy – Drug Sciences
Virtual room	
Office Hours (and modalities: e.g., by appointment, on line, etc.)	From Monday to Friday on appointment

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
70	60	10	105
CFU/ETCS			
7			

Learning Objectives	The learning objectives of the course are to teach students the mechanism of action of different drugs with a specific interest on their toxic effects. Moreover, the course focus on toxicodynamics and toxicokinetics aspects of Xenobiotics.
Course prerequisites	Knowledge of pharmacology, physiology and biochemistry

Teaching strategies	During the lectures the fundamental concepts of toxicology will be addressed, together with toxicokinetics and toxicodynamics, methodology of experimental pharmacology and risk evaluation. There will be described and commented toxicological characteristic of the major xenobiotics. Teaching methods foresee live lessons with ppt slides on the topics of the program. Moreover, there will also be some research in the literature of specific toxicology case.
Expected learning outcomes in	This course has the objective to enable the students to recognize and understand

terms of	the basic concepts of toxicokinetics and toxicodynamics, the methods of experimental toxicology. Moreover, this course will give the students the basis to evaluate the relationship between risk and benefits when it comes to xenobiotic exposition or in general after being exposed to a drug. This is pivotal for the student as he/she will be able to apply this knowledge when they will exercise the profession of pharmacist. Last, the course aim at increasing the students' communication ability in the scientific field.
Knowledge and understanding on:	<ul style="list-style-type: none"> o Ability to describe various toxicology aspects o Classification of different toxic agents o Mechanism of toxicity and mechanism of detoxification o Organ specific toxicity
Applying knowledge and understanding on:	<ul style="list-style-type: none"> o Knowledge of the most important toxic agents o Knowledge of mechanism of toxicity o Understanding of the damage induced by toxic agents' exposition o Understanding of target specificity
Soft skills	<p><i>Making informed judgments and choices</i></p> <ul style="list-style-type: none"> o Ability of distinguish between different xenobiotics, mechanism of action, and specific targets o Ability to analyse all the process that a specific xenobiotic will undergo <p><i>Communicating knowledge and understanding</i></p> <ul style="list-style-type: none"> o Appropriate use of specific scientific language for classification and identification of toxic substances and mechanism of toxicity <p><i>Capacities to continue learning</i></p> <ul style="list-style-type: none"> o Ability to understand scientific publications, use as tools during lessons or suggested by the professor
Syllabus	
Content knowledge	<p>BASICS OF GENERAL TOXICOLOGY: Toxic agents classification and definitions. Gradual and quantal dose-response curves, analysable parameters.</p> <p>TOXICOKINETICS: absorption, distribution, metabolism and excretion of xenobiotics. Biotransformation reactions. Toxicogenetics.</p> <p>CELLULAR TOXICITY: Interaction between terminal toxicant and target organ, necrotic and apoptotic damage. Cell damage mechanisms: ATP depletion and mitochondrial damage, increased cytoplasmic calcium, oxidative stress, endoplasmic reticulum stress and autophagy, adaptive cell responses.</p> <p>MUTAGENESIS AND CARCINOGENESIS: gene and chromosomal mutations. Neoplastic transformation, tumor cell development and progression. Genotoxic and epigenetic carcinogens: definition, mechanism of action and toxic effects.</p> <p>ORGAN TOXICITY: toxic effect of drugs and xenobiotics on: central nervous system, liver, kidneys, heart, skin. Immunotoxicity. Solvent toxicity. Heavy metal toxicity.</p> <p>TERATOGENESIS: Physiological basis of embryonic and fetal development. Congenital malformations. Mechanisms of action of teratogens. Classification of pharmacological agents with teratogenic risk.</p> <p>TOXIC AGENTS: Doping toxicology</p> <p>EXPERIMENTAL PHARMACOLOGY: Description, definition and applications of in vitro and in vivo models. In vitro and in vivo toxicological and carcinogenicity tests.</p>
Texts and readings	<i>TOXICOLOGY</i> Casarett&Doull';

	ELEMENTS OF TOXICOLOGY Casarett & Doull's (EMSI)
Notes, additional materials	Examples of websites for consultation: https://pubmed.ncbi.nlm.nih.gov/
Repository	Shared by the Professor / Lecturer (e.g. via Microsoft Teams)
Assessment	
Assessment methods	Oral exam
Assessment criteria	<ul style="list-style-type: none"> • Knowledge and understanding <ul style="list-style-type: none"> o Ability to explain and classify mechanisms of toxicity /cytotoxicity and what a xenobiotic does when enters the body o Ability to categorize the different mechanism of detoxification o Ability to explain specific toxicity of xenobiotics studied in the class • Applying knowledge and understanding <ul style="list-style-type: none"> o Organ specific toxicity o Classification of different xenobiotics based on their mechanism of action • Autonomy of judgment <ul style="list-style-type: none"> o Ability to categorise different classes of xenobiotics o Ability of classify organ specific toxicity • Communicating knowledge and understanding <ul style="list-style-type: none"> o Appropriate terminology • Capacities to continue learning <ul style="list-style-type: none"> o Ability to demonstrate the comprehension of the topic studied in the class
Final exam and grading criteria	<i>The assessment for this course is represented by an oral exam. Through questions related to the course, it will be assessed whether the student has reached the comprehension and knowledge of the topics that have been explained during the course. Moreover, the student will be evaluated for its ability of connecting different area of toxicology. The minimum knowledge to pass the exam include the knowledge of the specific toxicity mechanism, their evaluation, physiological reaction at the basis of toxic response, possibility of intervention, and induced physio-pathological condition</i>
Further information	

