



## Subject card

Subject name and code	Elements of pharmacology, PG_00053342						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2022/2023		
Education level	second-cycle studies		Subject group		Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Pharmaceutical Technology and Biochemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Agnieszka Potęga				
	Teachers		dr inż. Agnieszka Potęga				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		2.0		18.0	50
Subject objectives	<p>Expanding the knowledge of medicinal substances in the field of general pharmacology and applied pharmacology, in particular:</p> <ul style="list-style-type: none"><li>Understanding the mechanisms of drug action, their fate in the body and the relationship between dose and pharmacological effect of a drug.</li><li>Learn about side effects and drug interactions.</li><li>Getting to know the form of the drug and methods of creating the form of the drug.</li></ul>						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems		The student is able to use his knowledge of basic subjects to predict the behavior of a medicinal substance in biological systems.		[SK5] Assessment of ability to solve problems that arise in practice		
	[K7_W51] Knows and understands, to an increased extent, selected aspects of chemistry and biochemistry constituting general knowledge in the field of biomedical engineering.		The student acquires knowledge of pharmacokinetics, pharmacodynamics and side effects of medicinal substances, is able to present the basic mechanisms of drug action, describes the stages of drug research, characterizes various forms of drugs and the methods of their preparation.		[SW1] Assessment of factual knowledge		

Subject contents	<ul style="list-style-type: none"><li>• <b>Introduction</b> - definitions (active substance, medicinal substance, poison, potency, efficacy, pharmacology), drug effect (pharmaceutical phase, pharmacokinetic phase, pharmacodynamic phase), pharmacological effect.</li><li>• <b>Absorption and transport of the drug through membranes</b> - methods and sites of drug administration, barriers to be crossed during absorption, absorption and transport mechanisms (passive diffusion, facilitated diffusion, active transport, pinocytosis, phagocytosis, persorption), transport proteins (for medicinal substances).</li><li>• <b>Distribution of the drug in the body</b> - compartments, protein binding, distribution factors.</li><li>• <b>Biotransformation</b> - phase I reactions (oxidation, reduction, hydrolysis, decarboxylation), phase II reactions (conjugation with endogenous substrates), induction of transporting proteins and drug metabolising enzymes, first pass effect, inhibition of enzymatic activity, bioinactivation, biotransformation influencing factors.</li><li>• <b>Bioactivation</b> - reactive intermediate metabolites, drug toxicity.</li><li>• <b>Excretion</b> - enteric and hepatic routes, rate and amount of renal excretion.</li><li>• <b>Pharmacokinetics</b> - Pharmacokinetic parameters (bioavailability, bioequivalence, elimination half-life, minimum therapeutic concentration and minimum toxic concentration) and pharmacokinetic models (one-compartment model, two- or multi-compartment model, changes in blood plasma concentration after intravenous and oral administration, pharmacokinetics in special situations - pathological conditions, the elderly).</li><li>• <b>Pharmacodynamics</b> - mechanisms of drug action, pharmacological action through receptors (receptor concept, types and subtypes of receptors, receptor reserve, agonists and antagonists, ion channels).</li><li>• <b>Dosage and drug action dependence on dose or concentration</b> - dependence curves, indices and pharmacological values.</li><li>• <b>Adverse drug reactions</b> - allergic reactions to drugs, side effects, drug dependence.</li><li>• <b>Drug interactions</b> - pharmaceutical interactions, pharmacokinetic interactions, pharmacodynamic interactions, avoiding interactions.</li><li>• <b>Searching for and testing new drugs</b> - preclinical and clinical trials, placebo action, types of drug testing.</li><li>• <b>Chronopharmacology</b></li><li>• <b>Applied pharmacology</b> - drug forms and methods of preparation (powders, granules, tablets, capsules, liposomes, microspheres, medicinal aerosols, syrups, ointments, creams, parenteral drugs), drug administration routes, injection drug form technology (ampoules, vials).</li></ul>		
Prerequisites and co-requisites	Basic knowledge of biochemistry and enzymology.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam - part 1 - lecture material 1 - 6.	60.0%	50.0%
	Written exam - part 2 - lecture material 7 - 12.	60.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"><li>1. E. Mutschler, G. Geisslinger, H.J. Kroemer, P. Ruth, M. Schäfer-Korting. Farmakologia i toksykologia. Podręcznik. Wydanie III polskie poprawione i uzupełnione. Redakcja naukowa W. Buczek. MedPharm Polska 2013.</li><li>2. S. Janicki, A. Fiebiga, M. Sznitowska. Farmacja stosowana. Podręcznik dla studentów farmacji. Wydawnictwo Lekarskie PZWL. Warszawa 2012, wydanie 4.</li></ol>	
	Supplementary literature	There are no requirements.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>Sample questions:</p> <ol style="list-style-type: none"><li>1. Define the terms: AUC and drug bioavailability - describe how these kinetic parameters can be determined.</li><li>2. List the mechanisms of transport and absorption through biological membranes. Characterize active transport.</li><li>3. List the main enzymes of phase I and II metabolism. Characterize the physiological function of one family of isoenzymes from each group, also giving examples of catalyzed reactions.</li></ol>		
Work placement	Not applicable		