GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Elements of pharmacology, PG_00053342 | | |
| Field of study | Biomedical Engineering, Biomedical Engineering, Biomedical Engineering | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2023/2024 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>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**

Expanding the knowledge of medicinal substances in the field of general pharmacology and applied pharmacology, in particular:

- Understanding the mechanisms of drug action, their fate in the body and the relationship between dose and pharmacological effect of a drug.
- Learn about side effects and drug interactions.
- Getting to know the form of the drug and methods of creating the form of the drug.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [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 |
| [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 |

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| Subject contents | • **Introduction** - definitions (active substance, medicinal substance, poison, potency, efficacy, pharmacology), drug effect (pharmaceutical phase, pharmacokinetic phase, pharmacodynamic phase), pharmacological effect.<br>• **Absorption and transport of the drug through membranes** - 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).<br>• **Distribution of the drug in the body** - compartments, protein binding, distribution factors.<br>• **Biotransformation** - 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.<br>• **Bioactivation** - reactive intermediate metabolites, drug toxicity.<br>• **Excretion** - enteric and hepatic routes, rate and amount of renal excretion.<br>• **Pharmacokinetics** - 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).<br>• **Pharmacodynamics** - mechanisms of drug action, pharmacological action through receptors (receptor concept, types and subtypes of receptors, receptor reserve, agonists and antagonists, ion channels).<br>• **Dosage and drug action dependence on dose or concentration** - dependence curves, indices and pharmacological values.<br>• **Adverse drug reactions** - allergic reactions to drugs, side effects, drug dependence.<br>• **Drug interactions** - pharmaceutical interactions, pharmacokinetic interactions, pharmacodynamic interactions, avoiding interactions.<br>• **Searching for and testing new drugs** - preclinical and clinical trials, placebo action, types of drug testing.<br>• **Chronopharmacology**<br>• **Applied pharmacology** - 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). |
| Prerequisites and co-requisites | Basic knowledge of biochemistry and enzymology. |

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
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| Written exam - part 2 - lecture material 7 - 12. | 60.0% | 50.0% |
| Written exam - part 1 - lecture material 1 - 6. | 60.0% | 50.0% |

**Recommended reading**

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| Basic literature | 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. Buczko. MedPharm Polska 2013.<br>2. S. Janicki, A. Fiebiga, M. Sznitowska. Farmacja stosowana. Podręcznik dla studentów farmacji. Wydawnictwo Lekarskie PZWL. Warszawa 2012, wydanie 4. |
| Supplementary literature | There are no requirements. |
| eResources addresses | Adresy na platformie eNauczanie: |

**Example issues/ example questions/ tasks being completed**

Sample questions:

1. Define the terms: AUC and drug bioavailability - describe how these kinetic parameters can be determined.
2. List the mechanisms of transport and absorption through biological membranes. Characterize active transport.
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.

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| Work placement | Not applicable |