MEDBIOT-02:	**PHARMACOLOGY**
GENERAL INFORMATION	
Course Coordinator(s)	Martina Smolić, MD, PhD, Assoc. Prof.
Associate(s)	Ines Bilić-Ćurčić, MD, PhD, Assoc. Prof. Hrvoje Roguljić, MD, PhD Vjera Ninčević, MD Tea Omanović Kolarić, MD
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Obligatory
Year of study, Semester	2nd Year / 3rd Semester
Credits (ECTS)	**5.5**
Teaching Method (number of classes)	Lectures 30; Seminars: 15; Exercises: 30
Expected Number of Students in the Course	25-30
COURSE DESCRIPTION	
Course objectives	
Evaluation of basic concepts and principles of pharmacodynamics and pharmacokinetics. To train students in the interpretation of molecular and cellular mechanisms of action, routes of administration, indications, therapeutic effects, side effects and contraindications for the administration of particular drug groups. Evaluation of basic concepts in toxicology and principles of procedures for poisoning and application of specific antidotes. Introduce students to the role and impact of biotechnology on pharmacology, as well as to the basic principles of new drug development and the development of new pharmacotherapy-biotechnology strategies for the treatment of currently incurable diseases.	
Enrolment requirements and requiredentry competences for the course	
Completed undergraduate university study programme from the area of natural sciences (chemistry, biology) or biotechnical sciences, or biomedicine and healthcare. Completed and passed courses from 1st year of the study.	
Learning outcomes at the level of the study programme to which the course contributes	
BIOTECH-1; BIOTECH-3; BIOTECH10; MEDBIOT-5	
Expected learning outcomes at the level of the course	
After the lectures, seminars and labs, self-study and the passed exam students will be able to: 1. Explain the basic principles of pharmacokinetics and pharmacodynamics 2. Distinguish between the basic groups of drugs, their use, contraindications, side effects and interactions. 3. Outline the basic concepts in toxicology. 4. Demonstrate the application of biotechnology and molecular biology methods in pharmacology. 5. Interpret the principles of new drug development	
Course Content	
Lectures: General principles of Pharmacology. Basic concepts and history of pharmacology. Drugs legislation. Original and generic drugs. Herbal preparations and homeopathy. Mechanism of action of drugs. The fate of the drug in the body. Exploring new drugs from molecule to drug. Lists of drugs. How drugs work. The autonomic nervous system. General principles of chemical transmission. Neurochemical transmission (drugs acting sites). Cardiovascular drugs. Antiarrhythmics. Cardioactive glycosides. Antihypertensives. Control of smooth muscle tone of blood vessels. Pharmacology of central nervous system. Chemical signalisation in central nervous	

system. Target sites of drug action. Amino acid transmitters and other transmitters. Pain. Analgesics. Anesthetics. Chemical mediators for signal transmission. Pharmacology of the digestive system. Tumor biology and drug used in treatment of neoplasms. Pathogenesis of malignancy, principles of cytotoxic drugs. Possible new approaches in the treatment of malignancies.
Antimicrobial drugs and chemotherapy for infectious diseases. Molecular basis of chemotherapy.
Introduction to Toxicology. Toxicological terms and definitions. Specific chemical substances. Pesticides. Genomics, pharmacogenomics, personalized medicine. Drug development, molecular biotechnology, economics in medical biotechnology.
Problem seminars: Drug binding to molecules in the cell. Drug specificity. Receptor classification. Drug-receptor interaction. Movement of drug molecules through cellular barriers. Absorption and distribution of drugs. Drug availability. Drug metabolism. Biotransformation reactions.
Receptor proteins. Ion channels as sites of action of drugs. Cellular mechanisms (excitation, contraction, secretion). Regulation of intracellular calcium. Muscular contraction. Excretion of drugs and their metabolites. The peripheral nervous system. Cholinergic receptor agonists and antagonists. Effects of drugs on cholinergic transmission. Adrenergic receptor agonists and antagonists, drugs that affect noradrenergic transmission.
The action of different drug groups. Diuretics and RAAS inhibitors. Transport mechanisms. Pharmacology of diuretics and RAAS inhibitors. Calcium channel blockers, vasodilators.
Asthma medications. Drugs used in chronic bowel disease. Antiseizure drugs. Mechanism of antiseizure drugs action. Antidepressants. Addictive drugs and drug abuse. Psychomotor stimulants. Psychomimetics. The nature of drug addiction. Ethanol. Cannabis. Anesthetics. Non-steroidal anti-inflammatory drugs, anti-rheumatics. Treatment of chronic pain. Drugs with effect on the reproductive system. Endocrine reproduction control and medications that affect it. Contraceptives. Pancreatic hormones and diabetes treatment. Antibacterial drug resistance. Antimicrobial activity, resistance, pharmacokinetics, clinical use of antimicrobials. Antiviral drugs. Biological drugs. Pancreatic hormones and diabetes treatment.
Laboratory excercises: Pharmacokinetics. Excretion of drugs and their metabolites. Monitoring of antiepileptic therapy. Monitoring of immunosuppressive therapy. Mechanism of action of antipsychotics. Monitoring the effect and side effects of opioid analgesics. The effect of anesthetics. Drugs for the treatment of coagulation disorders and dyslipidemia.
New tumor drugs, kinase inhibitors and growth factors. Mechanism of action, clinical application. Monoclonal antibodies, from structure to therapeutic use. Vaccines.

Type of instruction

Lectures; Problem seminars; laboratory exercises

Student responsibilities

Attending all forms of teaching is compulsory, and the student must attend all knowledge tests. The student can justify absenteeism with 30% (full-time students) or 50% (part-time students) of each form of teaching. For every undrafted seminar student must pass preliminary exam on. The student is required to access all forms of assessment.

Screening of student's work *(Correlation between learning outcomes, teaching methods and grading)*

Type of activity	ECTS	Learning Outcome	Student activity	Assessment methods	Rating points	
					Min.	Max.
Class attendance (lectures, seminars, excercises)	2	2.5	Class attendance, Seminar essay	Seminar presentation Seminar preliminar exams Laboratory exrcises	1.5 1.5 3	5 7 8
Knowledge assess-	3.5	1-5	Partial tests	-	44	80

ment (partial tests)						
Final exam	3.5	1-5	Learning for the final exam	Written exam (unless they have passed partial test I, II)	44	80
Total	**5.5**				**50**	**100**

Evaluation of the partial exams

Percentage of correctly completed tasks (%)	Grade
55-69.99	22-26
70-79.99	27 - 31
80-92.49	32- 36
92.50-100	37 - 40

The final exam is required for students who did not pass one of the partial test I and II during the year.

Evaluation of the written part of the final exam

Percentage of correctly completed tasks (%)	Grade
55-69.99	44-55
70-79.99	56-63
80-92.49	64-73
92.5-100	74-80

Formation of the final grades:
The points earned during the class were joined by the points earned at the final exam. The rating is absolutely absolutely distributed, that is, based on the final achievement and is compared with the numerical system as follows*:*
A – Excellent (5): 90-100 grade points; B – Very Good (4): 80-89.99 grade points; C – Good (3): 65-79.99 grade points; D – sufficient (2): 50-64.99 grade points

Mandatory Literature (available in the library and via other media)

Title	Number of copies in the library	Availability through other media
Trevor AJ, Katzung BG et al. Pharmacology (examination and board review). 12th Ed., The McGraw-Hill Companies. Inc., 2019.		
Crommelin DJA, Sindelar RD, Meibohm B: Pharmaceutical Biotechnology: Fundamentals and Applications. 5th Ed., Springer International Publishing, 2018.		

Optional literature

Katzung B.G. Basic and Clinical Pharmacology, 14th Ed., The McGraw-Hill Companies, Inc., 2018.

Methods of monitoring quality that ensure acquisition of exit competences

Anonymous, quantitative, standardized student survey on the subject and work of teachers conducted by the Office for Quality of the Faculty of Medicine in Osijek and/or the Faculty of Food Technology Osijek.

Note

E-learning is not within the standard of hourly rate the class, but is used in class and contains links to various pages, videos and audio materials available on the web pages.