



PHARMACY
INTEGRATED ACADEMIC STUDIES
THE THIRD YEAR OF STUDIES

2024/2025

MEDICINAL CHEMISTRY 2

Course Name:

MEDICINAL CHEMISTRY 2

Medicinal chemistry 7 ECTS. There are 4 hours of active classes per week (2 hours of lectures and 2 hours of work in a small group)

TEACHERS AND ASSOCIATES WHO PERFORM TEACHING:

	Name and surname	Email	
1.	Slobodan Novokmet	slobodan.novokmet@fmn.kg.ac.rs	Full Professor
2.	Isidora Milosavljevic	isidora.milosavljevic@fmn.kg.ac.rs	Assistant Professor
3.	Jovana Novakovic	jovana.novakovic@fmn.kg.ac.rs	Assistant Professor
4.	Maja Savic	maja.savic@fmn.kg.ac.rs	Teaching Assistant
5.	Nevena Lazarevic	nevenasdragic@gmail.com	Teaching Assistant
6.	Jelena Terzic	jelena.terzic@fmn.kg.ac.rs	Junior Teaching Assistant

COURSE STRUCTURE:

Title	Week	Lectures	Small group work	Teachers
Medicinal chemistry 2	15	2	2	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
				$\Sigma 30+30=60$

GRADING SYSTEM:

The grade is equivalent to the number of points earned (see tables). Points are earned in two ways:

PRE-EXAM OBLIGATIONS:

2 tests that include material covered in lectures - 50 points.

FINAL EXAM:

Final written exam - 50 points.

Medicinal chemistry 2	MAXIMUM POINTS		
	Tests	Final written exam	Σ
	2 x 25	50	
Σ	50	50	100

The final grade is formed as follows:

In order to pass the course, the student must obtain a minimum of 51 points.

In order to pass the course, the student must:

1. acquires more than 50% of the points (26 points) provided for the pre-exam activity (at least 13 points on the first test and at least 13 points on the second test)
2. acquires more than 50% of the points provided for the written final exam

Points	grade
0 - 50	5
51 - 60	6
61 - 70	7
71 - 80	8
81 - 90	9
91 - 100	10

LITERATURE:

TEXTBOOKS	THE AUTHORS	PUBLISHER	THE LIBRARY
Introduction to Medicinal Chemistry, 4th Edition.	Patrick GL (Ed)	Oxford: University Press; 2009	Yes
Essentials of Pharmaceutical Chemistry, 3rd Edition.	Cairns D (Ed)	London, Chicago: Pharmaceutical Press; 2008	Yes
Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th Edition.	Beale JM, Block JH (Eds)	Philadelphia: Lippincott Williams & Wilkins; 2011	Yes
Fundamentals of Medicinal Chemistry	Thomas G (Ed)	London, United Kingdom, 2003	Yes
All lectures and material for group work are available on the website of the Faculty of Medical Sciences: www.medf.kg.ac.rs			

THE PROGRAM

TEACHING UNIT 1:

HISTAMINE AND ITS IMPORTANCE IN MEDICINAL CHEMISTRY

Lectures - 2 hours	Work in a small group - 2 hours
The role of histamine as a biogenic amine involved in various physiological processes, including allergic responses, gastric acid secretion, and neurotransmission. It should also cover how understanding histamine's actions has led to the development of histamine receptor antagonists, which are crucial in treating allergies, peptic ulcers, and other conditions, and discuss the impact of histamine-related research on drug design and therapeutic strategies.	An introduction to Medicinal Chemistry

TEACHING UNIT 2:

HISTAMINE H1 - RECEPTOR ANTAGONISTS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and mechanisms of action of H1-receptor antagonists, their role in blocking histamine at H1 receptors to alleviate symptoms of allergic reactions, their therapeutic uses in treating conditions such as allergic rhinitis, urticaria, and motion sickness, as well as their pharmacokinetic profiles, potential side effects, and interactions with other medications.	Functional group characteristics and roles

TEACHING UNIT 3:

HISTAMINE H2 - RECEPTOR ANTAGONISTS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and mechanisms of action of H2-receptor antagonists, their role in competitively inhibiting histamine at H2 receptors in the gastric mucosa to reduce gastric acid secretion, their therapeutic applications in treating conditions such as peptic ulcers and gastroesophageal reflux disease (GERD), and their pharmacokinetic properties, potential side effects, and drug interactions.	Identify the acidic and basic functional groups.

TEACHING UNIT 4:

PROTON PUMP INHIBITORS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and mechanisms of action of proton pump inhibitors (PPIs), their role in irreversibly inhibiting the H ⁺ /K ⁺	Ionization - examples of drug molecules

ATPase enzyme in the gastric parietal cells, their therapeutic uses in treating conditions such as peptic ulcers and gastroesophageal reflux disease (GERD), and their pharmacokinetic properties, potential side effects, and interactions with other medications.

TEACHING UNIT 5:

CALCIUM CHANNEL BLOCKERS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and mechanisms of action of calcium channel blockers, their role in inhibiting calcium influx through L-type calcium channels, their therapeutic applications in treating hypertension, angina, and certain arrhythmias, and their pharmacokinetic properties, side effects, and potential drug interactions.	Lipophilicity - examples of drug molecules

TEACHING UNIT 6:

CALCIUM CHANNEL BLOCKERS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and mechanisms of action of calcium channel blockers, their role in inhibiting calcium influx through L-type calcium channels, their therapeutic applications in treating hypertension, angina, and certain arrhythmias, and their pharmacokinetic properties, side effects, and potential drug interactions.	Solubility - examples of drug molecules

TEACHING UNIT 7:

DIURETICS

Lectures - 2 hours	Work in a small group - 2 hours
Different classes of diuretics (such as thiazide, loop, and potassium-sparing diuretics), their chemical structures, mechanisms of action, effects on renal function, and their therapeutic uses in treating conditions like hypertension, heart failure, and edema, as well as their potential side effects and interactions with other medications.	Biotransformation of drug molecules; oxidation reactions – examples

TEACHING UNIT 8:

DIURETICS

Lectures - 2 hours	Work in a small group - 2 hours
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Different classes of diuretics (such as thiazide, loop, and potassium-sparing diuretics), their chemical structures, mechanisms of action, effects on renal function, and their therapeutic uses in treating conditions like hypertension, heart failure, and edema, as well as their potential side effects and interactions with other medications.	Biotransformation of drug molecules; oxidation reactions - examples
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TEACHING UNIT 9:

ANGIOTENSIN-CONVERTING ENZYME INHIBITORS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and mechanisms of action of ACE inhibitors, their role in inhibiting the conversion of angiotensin I to angiotensin II, their therapeutic applications in managing hypertension and heart failure, as well as their pharmacokinetic properties, potential side effects, and drug interactions.	Biotransformation of drug molecules; reduction and hydrolysis reactions - examples

TEACHING UNIT 10:

AT1 RECEPTOR ANTAGONISTS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical properties and structures of AT1 receptor antagonists (also known as angiotensin II receptor blockers or ARBs), their mechanisms of action in blocking the angiotensin II type 1 receptor, their therapeutic uses in treating hypertension and heart failure, and their pharmacokinetic and pharmacodynamic profiles..	Biotransformation of drug molecules; second phase reactions - examples

TEACHING UNIT 11:

HYDROXYMETHYL GLUTARYL COENZYME A REDUCTASE INHIBITORS

Lectures - 2 hours	Work in a small group - 2 hours
The mechanism of action of HMG-CoA reductase inhibitors (statins), their chemical structures, their role in cholesterol biosynthesis inhibition, and their therapeutic applications in managing hyperlipidemia and cardiovascular diseases, as well as potential side effects and drug interactions	Medicinal chemistry of receptors

TEACHING UNIT 12:

HYDROXYMETHYL GLUTARYL COENZYME A REDUCTASE INHIBITORS

Lectures - 2 hours	Work in a small group - 2 hours
The mechanism of action of HMG-CoA reductase inhibitors (statins), their chemical structures, their role in cholesterol biosynthesis inhibition, and their therapeutic	Medicinal chemistry of enzymes and nucleic acids

applications in managing hyperlipidemia and cardiovascular diseases, as well as potential side effects and drug interactions.

TEACHING UNIT 13:

AGONISTS AND ANTAGONISTS OF ADRENERGIC RECEPTORS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and pharmacological profiles of adrenergic receptor agonists and antagonists, their interactions with adrenergic receptors, the impact of these interactions on receptor function and downstream signaling pathways, and their implications for drug design and therapeutic applications.	Prodrugs - examples

TEACHING UNIT 14:

AGONISTS AND ANTAGONISTS OF ADRENERGIC RECEPTORS

Lectures - 2 hours	Work in a small group - 2 hours
The chemical structures and pharmacological profiles of adrenergic receptor agonists and antagonists, their interactions with adrenergic receptors, the impact of these interactions on receptor function and downstream signaling pathways, and their implications for drug design and therapeutic applications.	Examples of drug molecules and their metabolizam

TEACHING UNIT 15:

RECAPITULATION

Lectures - 2 hours	Work in a small group - 2 hours
A comprehensive review of key concepts covered throughout the course, reinforce critical learning points, clarify any misunderstandings, and integrate knowledge across different topics to ensure a thorough understanding of the subject matter.	Exam simulation

LECTURE SCHEDULE

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Week	Date	Time	Place	Type	Teaching Unit 1	Teacher
1				L	HISTAMINE AND ITS IMPORTANCE IN MEDICINAL CHEMISTRY	Ass. Prof. Isidora Milosavljevic
				WSG	HISTAMINE AND ITS IMPORTANCE IN MEDICINAL CHEMISTRY	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
2				L	HISTAMINE H1-RECEPTOR ANTAGONISTS	Ass. Prof. Isidora Milosavljevic
				WSG	HISTAMINE H1-RECEPTOR ANTAGONISTS	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
3				L	HISTAMINE H2-RECEPTOR ANTAGONISTS	Ass. Prof. Jovana Novakovic
				WSG	HISTAMINE H2-RECEPTOR ANTAGONISTS	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
4				L	PROTON PUMP INHIBITORS	Ass. Prof. Jovana Novakovic
				WSG	PROTON PUMP INHIBITORS	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
5				L	CALCIUM ANTAGONISTS	Ass. Prof. Jovana Novakovic
				WSG	CALCIUM ANTAGONISTS	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
6				L	CALCIUM ANTAGONISTS	Ass. Prof. Jovana Novakovic

LECTURE SCHEDULE

Week	Date	Time	Place	Type	Teaching Unit 1	Teacher
				WSG	CALCIUM ANTAGONISTS	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
The First test						
7				L	DIURETICS	Ass. Prof. Isidora Milosavljevic
				WSG	DIURETICS	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
8				L	DIURETICS	Ass. Prof. Isidora Milosavljevic
				WSG	DIURETICS	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
9				L	ANGIOTENSIN-CONVERTING ENZYME INHIBITORS	Ass. Prof. Jovana Novakovic
				WSG	ANGIOTENSIN-CONVERTING ENZYME INHIBITORS	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
10				L	AT1 RECEPTOR ANTAGONISTS	Ass. Prof. Jovana Novakovic

LECTURE SCHEDULE

Week	Date	Time	Place	Type	Teaching Unit 1	Teacher
				WSG	AT1 RECEPTOR ANTAGONISTS	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
11				L	HYDROXYMETHYL GLUTARYL COENZYME A REDUCTASE	Ass. Prof. Isidora Milosavljevic
				WSG	HYDROXYMETHYL GLUTARYL COENZYME A REDUCTASE	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
12				L	HYDROXYMETHYL GLUTARYL COENZYME A REDUCTASE	Ass. Prof. Isidora Milosavljevic
				WSG	HYDROXYMETHYL GLUTARYL COENZYME A REDUCTASE	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
The Second Test						
13				L	AGONISTS AND ANTAGONISTS OF ADRENERGIC	Ass. Prof. Isidora Milosavljevic
				WSG	AGONISTS AND ANTAGONISTS OF ADRENERGIC	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
14				L	AGONISTS AND ANTAGONISTS OF ADRENERGIC	Ass. Prof. Isidora Milosavljevic

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Week	Date	Time	Place	Type	Teaching Unit 1	Teacher
				WSG	AGONISTS AND ANTAGONISTS OF ADRENERGIC	Ass. Prof. Jovana Novakovic Ass. Prof. Isidora Milosavljevic
15				L	RECAPITULATION	Ass. Prof. Jovana Novakovic
				WSG	RECAPITULATION	Ass. Prof. Isidora Milosavljevic Ass. Prof. Jovana Novakovic
					Final written exam	