PHARMACEUTICAL CHEMISTRY 2

INTEGRATED ACADEMIC STUDIES OF PHARMACY

THIRD YEAR OF STUDY

2025/2026.

Course:

PHARMACEUTICAL CHEMISTRY 2

The course is evaluated with 6 ECTS. There are 5 classes of active teaching per week (3 classes of lectures and 2 classes of practice)

TEACHING STAFF:

	Name and surname	Email addresses	Title
1.	Marina Vesović	marina.vesovic@fmn.kg.ac.rs	Associate Professor
2.	Miloš Nikolić	milos.nikolic@fmn.kg.ac.rs	Associate Professor
3.	Nevena Jeremić	njeremic@fmn.kg.ac.rs	Associate Professor
4.	Ana Živanović	ana.zivanovic@fmn.kg.ac.rs	Assistant professor
5.	Nikola Nedeljković	nikola.nedeljkovic@fmn.kg.ac.rs	Assistant professor

COURSE STRUCTURE:

Module	**Name of module**	**Week**	**Lectures weekly**	**Work in small group**	**Teacher- module supervisor**
1	Antiviral agents. Antineoplastic drugs. Opioid analgesics.	7	3	2	Marina Vesović
2	Nonsteroidal anti-inflammatory drugs. Analgoantipyretics. Antirheumatic drugs of different structures. Anxiolytics and hypnotics. Antidepressants. Serotonin receptors agonists and antagonists. Antiepileptics. Local anesthetics. General anesthetics.	8	3	2	Miloš Nikolić

EVALUATION:

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

FINAL TESTS BY MODULES: In this way, the student can gain up to 70 points, according to the attached table. Following the demonstrated knowledge, the module test tasks are scored from 0-2 points, at 0.5 points each.
FINAL EXAM: In this way, the student can earn up to 30 points, according to the attached table. Based on the demonstrated knowledge, the tasks on the final exam were scored from 0-2 points, at 0.5 points each.

MODULE		MAXIMUM OF POINTS	
		final test	**Σ**
1	Antiviral agents. Antineoplastic drugs. Opioid analgesics.	35 (minimum 18 points)	35
2	Nonsteroidal anti-inflammatory drugs. Analgoantipyretics. Antirheumatic drugs of different structures. Anxiolytics and hypnotics. Antidepressants. Serotonin receptors agonists and antagonists. Antiepileptics. Local anesthetics. General anesthetics.	35 (minimum 18 points)	35
FINAL EXAM		30 (minimum 15.5 points)	30
Σ			**100**

Note: Only students who have previously passed all final module tests can take the final exam.

The final grade is formed as follows:

To pass the course, the student has to obtain a minimum of 51 points and pass all modules as well as the final exam.

To pass the module the student has to:
1. Pass the module test, i.e. has more than 50% correct answers.

To pass the final exam, the student has to:
1. Obtain more than 50% points in that final exam

Number of points	Grade
0 - 50	**5**
51 - 60	**6**
61 - 70	**7**
71 - 80	**8**
81 - 90	**9**
91 - 100	**10**

TESTS BY MODULES

MODULE 1.

FINAL TEST of module 1
0-35 points

EVALUATION OF THE MODULE TEST
Each question is scored 0-2 points

MODULE 2.

FINAL TEST of module 2
0-35 points

EVALUATION OF THE MODULE TEST
Each question is scored 0-2 points

LITERATURE:

Module	Module name	Textbook title	Authors	Publisher	Library
1	Antiviral agents. Antineoplastic drugs. Opioid analgesics.	Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry.	John M. Beale John H. Block	Lippincott Williams & Wilkins; 2011.	
		Foye's Principles of Medicinal Chemistry	Thomas Lemke	Wolters Kluwer. 2013.	
		Pharmaceutical and medicinal chemistry.	David G. Watson	Churchill Livingstone; 2011.	
2	Nonsteroidal anti-inflammatory drugs. Analgoantipyretics. Antirheumatic drugs of different structures. Anxiolytics and hypnotics. Antidepressants. Serotonin receptors agonists and antagonists. Antiepileptics. Local anesthetics. General anesthetics.	Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry	John M. Beale John H. Block	Lippincott Williams & Wilkins; 2011.	
		Foye's Principles of Medicinal Chemistry	Thomas Lemke	Wolters Kluwer. 2013	
		Pharmaceutical and medicinal chemistry	David G. Watson	Churchill Livingstone; 2011.	

All lectures can be found on the website of the Faculty of Medicine: www.medf.kg.ac.rs

THE PROGRAM

FIRST MODULE: ANTIVIRAL AGENTS, ANTINEOPLASTIC DRUGS, OPIOID ANALGESICS

TEACHING UNIT 1 (FIRST WEEK):

ANTIVIRAL AGENTS (FIRST PART).

Lectures: 3 classes	Exercises: 2 classes

Antiviral agents, interferons, viral vaccines, inhibitors of the early viral replication and penetration, neuraminidase inhibitors, inhibitors of viral replication I

TEACHING UNIT 2 (SECOND WEEK):

ANTIVIRAL AGENTS (SECOND PART).

Lectures: 3 classes	Exercises: 2 classes

Inhibitors of viral replication II, *HIV* antivirotics, non-nucleoside reverse transcriptase inhibitors, *HIV* protease inhibitors, integrase inhibitors

TEACHING UNIT 3 (THIRD WEEK):

ANTINEOPLASTIC DRUGS (FIRST PART).

Lectures: 3 classes	Exercises: 2 classes

Treatment of malignancies, alkylating agents

TEACHING UNIT 4 (FOURTH WEEK):

ANTINEOPLASTIC DRUGS (SECOND PART).

Lectures: 3 classes	Exercises: 2 classes

Antimetabolites, antibiotics

TEACHING UNIT 5 (FIFTH WEEK):

ANTINEOPLASTIC DRUGS (THIRD PART).

Lectures: 3 classes	Exercises: 2 classes

Herbal products, hormones and antihormones, immunotherapy and other cytostatics

TEACHING UNIT 6 (SIXTH WEEK):

OPIOID ANALGESICS (FIRST PART).	
Lectures: 3 classes	Exercises: 2 classes
Biosynthesis of opioids, groups of opioid analgesics, chemical structure of morphine, chemical structure-activity relationship, opioid antagonists, endogenous opioid peptides, synthetic opioid analgesics (first part)	

TEACHING UNIT 7 (SEVENTH WEEK):

OPIOID ANALGESICS (SECOND PART).	
Lectures: 3 classes	Exercises: 2 classes
Synthetic opioid analgesics (second part), opioid analgesics of various structures, opioid antidiarrheals, opioid antitussives	

SECOND MODULE: NONSTEROIDAL ANTI-INFLAMMATORY DRUGS. ANALGOANTIPYRETICS. ANTIRHEUMATIC DRUGS OF DIFFERENT STRUCTURES. ANXIOLYTICS AND HYPNOTICS. ANTIDEPRESSANTS. SEROTONIN RECEPTORS AGONISTS AND ANTAGONISTS. ANTIEPILEPTICS. LOCAL ANESTHETICS. GENERAL ANESTHETICS.

TEACHING UNIT 8 (EIGHTH WEEK):

NONSTEROIDAL ANTI-INFLAMMATORY DRUGS.	
Lectures: 3 classes	Exercises: 2 classes
N-arylanthranilic acid derivatives, aryl- and heteroaryl acetic acid derivatives, aryl- and heteroaryl-propanoic acid derivatives, oxicams, selective COX-2 inhibitors	

TEACHING UNIT 9 (NINTH WEEK):

ANALGOANTIPYRETICS. ANTIRHEUMATIC DRUGS OF DIFFERENT STRUCTURES.	
Lectures: 3 classes	Exercises: 2 classes
Salicylic acid and derivatives, pyrazolone and pyrazolidinedione derivatives, acetanilide derivatives, compounds of gold, uricostatics and uricosurics	

TEACHING UNIT 10 (TENTH WEEK):

ANXIOLYTICS AND HYPNOTICS.	
Lectures: 3 classes	Exercises: 2 classes
Structure-activity relationship of benzodiazepines, benzodiazepines without carbonyl group in C2, benzodiazepines with carbonyl group in C2, tricyclic and thienobenzodiazepine, competitive benzodiazepine antagonists, anxiolytics of different structure, barbiturates, other hypnotics with nitrogen in the cycle	

TEACHING UNIT 11 (ELEVENTH WEEK):

ANTIDEPRESSANTS.	
Lectures: 3 classes	Exercises: 2 classes
Tricyclic antidepressants, monoamine oxidase inhibitors	

TEACHING UNIT 12 (ELEVENTH WEEK):

SEROTONIN RECEPTORS AGONISTS AND ANTAGONISTS.	
Lectures: 3 classes	Exercises: 2 classes
Chemical properties and biological role of serotonin, serotonin antidepressants and anxiolytics, serotonin antimigraine drugs, $5HT_3$ receptor agonists, $5HT_3$ receptor antagonists, serotonin antiemetics, serotonin prokinetic	

TEACHING UNIT 13 (THIRTEENTH WEEK)

ANTIEPILEPTICS.

Lectures: 3 classes	Exercises: 2 classes

Barbituric acid derivatives, hydantoins, oxazolidinediones, succinimides, 1,4-benzodiazepines, dibenzazepine derivatives, dipropylacetic acid derivatives, new-generation antiepileptic drugs

TEACHING UNIT 14 (FOURTEENTH WEEK)

LOCAL ANESTHETICS.

Lectures: 3 classes	Exercises: 2 classes

Local anesthetics - amino esters and amino amides

TEACHING UNIT 15 (FIFTEENTH WEEK)

GENERAL ANESTHETICS.

Lectures: 3 classes	Exercises: 2 classes

Inhalation anesthetics, intravenous anesthetics

LESSON SCHEDULE FOR THE COURSE PHARMACEUTICAL CHEMISTRY 2

module	week	type	name of the teaching unit	teacher
1	**1**	**L**	Antiviral agents (first part).	Miloš Nikolić
1	**1**	**S**	Antiviral agents (first part).	Miloš Nikolić
1	**1**	**E**	Antiviral agents (first part).	Miloš Nikolić Nikola Nedeljković
1	**2**	**L**	Antiviral agents (second part).	Miloš Nikolić
1	**2**	**S**	Antiviral agents (second part).	Miloš Nikolić
1	**2**	**E**	Antiviral agents (second part).	Miloš Nikolić Nikola Nedeljković
1	**3**	**L**	Antineoplastic drugs (first part).	Marina Vesović
1	**3**	**S**	Antineoplastic drugs (first part).	Marina Vesović
1	**3**	**E**	Antineoplastic drugs (first part).	Marina Vesović Ana Živanović
1	**4**	**L**	Antineoplastic drugs (second part).	Ana Živanović
1	**4**	**S**	Antineoplastic drugs (second part).	Ana Živanović
1	**4**	**E**	Antineoplastic drugs (second part).	Marina Vesović Ana Živanović
1	**5**	**L**	Antineoplastic drugs (third part).	Ana Živanović
1	**5**	**S**	Antineoplastic drugs (third part).	Ana Živanović
1	**5**	**E**	Antineoplastic drugs (third part).	Marina Vesović Ana Živanović
1	**6**	**L**	Opioid analgesics (first part).	Nikola Nedeljković

LESSON SCHEDULE FOR THE COURSE PHARMACEUTICAL CHEMISTRY 2

module	week	type	name of the teaching unit	teacher
1	6	S	Opioid analgesics (first part).	Nikola Nedeljković
1	6	E	Opioid analgesics (first part).	Miloš Nikolić Nikola Nedeljković
1	7	L	Opioid analgesics (second part).	Nikola Nedeljković
1	7	S	Opioid analgesics (second part).	Nikola Nedeljković
1	7	E	Opioid analgesics (second part).	Miloš Nikolić Nikola Nedeljković
2	8	L	Nonsteroidal anti-inflammatory drugs.	Marina Vesović
2	8	S	Nonsteroidal anti-inflammatory drugs.	Marina Vesović
2	8	E	Nonsteroidal anti-inflammatory drugs.	Marina Vesović Ana Živanović
2	9	L	Analgoantipyretics. Antirheumatic drugs of different structures.	Marina Vesović
2	9	S	Analgoantipyretics. Antirheumatic drugs of different structures.	Marina Vesović
2	9	E	Analgoantipyretics. Antirheumatic drugs of different structures.	Marina Vesović Ana Živanović
2	10	L	Anxiolytics and hypnotics.	Nevena Jeremić
2	10	S	Anxiolytics and hypnotics.	Nevena Jeremić
2	10	E	Anxiolytics and hypnotics.	Nevena Jeremić Nikola Nedeljković
2	11	L	Antidepressants.	Ana Živanović
2	11	S	Antidepressants.	Ana Živanović

LESSON SCHEDULE FOR THE COURSE PHARMACEUTICAL CHEMISTRY 2

module	week	type	name of the teaching unit	teacher
2	**11**	**E**	Antidepressants.	Marina Vesović Ana Živanović
2	**12**	**L**	Serotonin receptors agonists and antagonists.	Nevena Jeremić
2	**12**	**S**	Serotonin receptors agonists and antagonists.	Nevena Jeremić
2	**12**	**E**	Serotonin receptors agonists and antagonists.	Nevena Jeremić Nikola Nedeljković
2	**13**	**L**	Antiepileptics.	Miloš Nikolić
2	**13**	**S**	Antiepileptics.	Miloš Nikolić
2	**13**	**E**	Antiepileptics.	Miloš Nikolić Nikola Nedeljković
2	**14**	**L**	Local anesthetics.	Nikola Nedeljković
2	**14**	**S**	Local anesthetics.	Nikola Nedeljković
2	**14**	**E**	Local anesthetics.	Miloš Nikolić Nikola Nedeljković
2	**15**	**L**	General anesthetics.	Nevena Jeremić
2	**15**	**S**	General anesthetics.	Nevena Jeremić
2	**15**	**E**	General anesthetics.	Nevena Jeremić Nikola Nedeljković
		E	**FINAL EXAM**	