



INTEGRATED ACADEMIC STUDIES OF PHARMACY

FIRST YEAR

2025/2026

PHARMACEUTICAL BIOLOGY WITH GENETICS

Course title:

PHARMACEUTICAL BIOLOGY WITH GENETICS

The course is evaluated with 7 ECTS.

There are 5 active classes per week (3 classes of lectures and 2 classes of small group activities).

TEACHERS AND ASSOCIATES:

PE	First name and surname	Email	Academic title
1.	Biljana Ljujić	bljujic74@gmail.com	Full Professor
2.	Olivera Milošević-Dorđević	olivera@kg.ac.rs	Full Professor
3.	Vladislav Volarević	drvolarevic@yahoo.com	Full Professor
4.	Danijela Todorović	dtodorovic@medf.kg.ac.rs	Full Professor
5.	Marina Gazdić Janković	marinagazdic87@gmail.com	Associate Professor
6.	Danijela Cvetković	c_danijela@yahoo.com	Assistant Professor
7.	Dragana Papic	drmiloradovic7@gmail.com	Teaching assistant
8.	Dragica Pavlovic	dragica.miloradovic8@gmail.com	Teaching assistant
9.	Nikolina Kastratović	n_kastratovic@outlook.com	Teaching assistant

COURSE STRUCTURE:

Module	Name of the course module	Weeks	Classes of lectures (weekly)	Classes of small group activities (weekly)	Teacher – in charge
1.	Basics of botany Cellular and molecular organization of the genome	7	3	2	Prof. dr Marina Gazdic Jankovic
2.	Biological significance of mutations	8	3	2	Prof. dr Marina Gazdic Jankovic

ASSESSMENT:

By fulfilling the pre-exam obligations and taking the final exam, the student can achieve a maximum of 100 points. The final grade is determined on the basis of the number of earned points, which could be earned in the following ways:

PRE-EXAM ACTIVITIES : Student can earn up to 40 points by examining two tests. The first test includes material from the first to the seventh teaching unit (the student in accordance with the demonstrated knowledge acquires 0 - 20 points). The second test includes material from the eighth to the fifteenth teaching unit (the student in accordance with the demonstrated knowledge acquires 0 - 20 points).

A student has the right to take a final exam if he has achieved more than 50% of points in the first test and more than 50% of points in the second test.

FINAL EXAM: The final exam is in the form of written/test exam, which is organized within the exam terms (dates), and includes total teaching material. In this way a student can earn up to 60 points in accordance with the demonstrated knowledge.

Determination of final grade		The maximal number of points		
		Pre-exam activities	Final exam	Σ
1	Basics of botany Cellular and molecular organization of the genome	20	60	
2	Biological significance of mutations	20		
Σ		40	60	100

The final grade is formed as follows:

In order to pass the course, the student must pass the pre-exam activities and the final exam. The final grade is formed according to the attached table.

Final grade	Number of points
10	91 – 100
9	81 – 90
8	71 – 80
7	61 – 70
6	51 – 60
5	< 51

LITERATURE:

Module	The title of textbook	Authors	Publisher	Library of faculty
Basics of botany	Introduction to Botany	Shipunov, Alexey	Minot State University, North Dakota, USA, 2020	URL: http://ashipunov.info/shipunov/school/biol_154/textbook/intro_botany.pdf
Celular and molecular organisation of the genome Biological significance of mutations	Emery's Elements of Medical Genetics	Turnpenny P, Ellard S.	15th edition, Elsevier Ltd., UK, 2017.	
	Human genetics: concepts and applications	Lewis R	9th edition, Mc Graw Hill, NY,USA, 2010.	
	Human molecular biology	Epstein J.E.	Cambrige University press, UK, 2003.	

Program of lectures:

THE FIRST MODULE:

Basics of botany Cellular and molecular organization of the genome

WEEK – 1:

CELL BIOLOGY

lectures (3 classes)	small groups activities (2 classes)
Cells - differences between prokaryotic and eukaryotic cells and between plant and animal cells; the morphology and role of the cellular organelles; transport of matter across the cell membrane	

WEEK – 2:

PLANT TISSUES

lectures (3 classes)	small groups activities (2 classes)
Organization of plants. Plant tissues: meristems, parenchyma, supportive tissues, epidermis and periderm, vascular tissues, secretory tissues	

WEEK – 3:

PLANT ORGANS

lectures (3 classes)	small groups activities (2 classes)
Plant organs: root, shoot, stem, leaf	

WEEK – 4:

PLANT REPRODUCTION

lectures (3 classes)	small groups activities (2 classes)
Plant reproduction: asexual, vegetative and sexual reproduction	

WEEK – 5:

CELL DIVISION

lectures (3 classes)	small groups activities (2 classes)
Cell cycle. Cell division – mitosis and meiosis. Gametogenesis – spermatogenesis and oogenesis.	

WEEK – 6

ORGANIZATION AND FUNCTION OF HUMAN GENOME

lectures (3 classes)	small groups activities (2 classes)
Chromosomes - chemical structure and physical topography of chromosomes. Human karyotype. Human karyotype standardization.	

WEEK – 7:

NUCLEIC ACIDS – STRUCTURE AND FUNCTION

lectures (3 classes)	small groups activities (2 classes)
DNA; gene – structure, length, number and function; genome, genotype, phenotype, gene polymorphism. RNA - structure, function and types. Mitochondrial genome	

THE SECOND MODULE:

Biological significance of mutations

WEEK – 8:

REPLICATION OF DNA

lectures (3 classes)	small groups activities (2 classes)
Replication of DNA molecules. Replication enzymes. Transitions and transversion	

WEEK – 9:

PROTEIN SYNTHESIS

lectures (3 classes)	small groups activities (2 classes)
Protein synthesis - transcription and translation. Regulation of gene expression: mechanisms of regulation of transcription and translation.	

WEEK – 10:

GENE MUTATIONS

lectures (3 classes)	small groups activities (2 classes)
Gene mutations: definition and types of gene mutations; mechanism of gene mutations; spontaneous mutation rate. Reparative mechanisms. Diseases caused by reparation disorders	

WEEK – 11:**MUTAGENIC AGENTS**

lectures (3 classes)	small groups activities (2 classes)
Effect of environmental agents in mutation induction. Chemical, physical and biological agents. Tests for the diagnosis of genotoxic agents: micronucleus test, SCE test and chromosomal aberration test	

WEEK – 12:**NUMERICAL CHROMOSOMAL ABERRATIONS**

lectures (3 classes)	small groups activities (2 classes)
Polyploidy and aneuploidy. Aneuploidies of autosomes and sex chromosomes and their effect on human health. Analysis of the karyotypes with numerical aberrations of autosomes and sex chromosomes.	

WEEK – 13:**STRUCTURAL CHROMOSOMAL ABERRATIONS**

lectures (3 classes)	small groups activities (2 classes)
Structural chromosome aberrations: deletions, duplications, inversions and translocations. Syndromes that occur as a consequence of structural chromosome aberrations. Analysis of karyotypes with structural chromosome aberrations.	

WEEK – 14:**PATTERNS OF INHERITANCE**

lectures (3 classes)	small groups activities (2 classes)
Patterns of inheritance in humans. Monogenic, polygenic and multifactorial inheritance.	

WEEK – 15:**GENETIC ENGINEERING - RECOMBINANT DNA TECHNOLOGY**

lectures (3 classes)	small groups activities (2 classes)
Clone and cloning. Recombinant DNA methods in medicine: hybridization, electrophoresis, PCR, blotting	

LESSONS SCHEDULE FOR THE COURSE PHARMACEUTICAL BIOLOGY WITH GENETICS

week	type	method unit name	Teacher
1	L	Cell biology	Assoc. Prof. Marina Gazdić Janković
1	SGA	Cell biology	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
2	L	Plant tissues	Assoc. Prof. Marina Gazdić Janković
2	SGA	Plant tissues	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
3	L	Plant organs	Assoc. Prof. Marina Gazdić Janković
3	SGA	Plant organs	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
4	L	Plant reproduction	Assoc. Prof. Marina Gazdić Janković
4	SGA	Plant reproduction	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
5	L	Cell division	Prof. Biljana Ljujić
5	SGA	Cell division	Prof. Biljana Ljujić Ass. Dragica Pavlović Ass. Nikolina Kastratović
6	L	Organization and function of human genome	Prof. Biljana Ljujić
6	SGA	Organization and function of human genome	Prof. Biljana Ljujić Ass. Dragica Pavlović Ass. Nikolina Kastratović
7	L	Nucleic acids – structure and function	Assoc. Prof. Marina Gazdić Janković

LESSONS SCHEDULE FOR THE COURSE PHARMACEUTICAL BIOLOGY WITH GENETICS

week	type	method unit name	Teacher
7	SGA	Nucleic acids – structure and function	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
8	L	Replication of DNA	Assoc. Prof. Marina Gazdić Janković
8	SGA	Replication of DNA THE FIRST MODULE TEST	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
9	L	Protein synthesis	Assoc. Prof. Marina Gazdić Janković
9	SGA	Protein synthesis	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
10	L	Gene mutation	Assoc. Prof. Marina Gazdić Janković
10	SGA	Gene mutation	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
11	L	Mutagenic agents	Assoc. Prof. Marina Gazdić Janković
11	SGA	Mutagenic agents	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović
12	L	Numerical chromosomal aberrations	Prof. Biljana Ljujić
12	SGA	Numerical chromosomal aberrations	Prof. Biljana Ljujić Ass. Dragica Pavlović Ass. Nikolina Kastratović
13	L	Structural chromosomal aberrations	Prof. Biljana Ljujić
13	SGA	Structural chromosomal aberrations	Prof. Biljana Ljujić Ass. Dragica Pavlović Ass. Nikolina Kastratović

LESSONS SCHEDULE FOR THE COURSE PHARMACEUTICAL BIOLOGY WITH GENETICS

week	type	method unit name	Teacher
14	L	Patterns of inheritance	Prof. Biljana Ljujić
14	SGA	Patterns of inheritance	Prof. Biljana Ljujić Ass. Dragica Pavlović Ass. Nikolina Kastratović
15	L	Genetic engineering - recombinant DNA technology	Assoc. Prof. Marina Gazdić Janković
15	SGA	Genetic engineering - recombinant DNA technology THE SECOND MODULE TEST	Assoc. Prof. Marina Gazdić Janković Ass. Dragica Pavlović Ass. Nikolina Kastratović