FUNDAMENTALS OF ONCOLOGY

MICROORGANISMS, IMMUNITY AND TUMORS

SECOND YEAR

2024/2025.

Subject:

FUNDAMENTALS OF ONCOLOGY

The course is evaluated with 5 ECTS. There are 4 hours of active teaching per week (2 hours of lectures and 2 hours of work in a small group).

TEACHERS:

	Name	E-mail	Title
1.	Ivan Jovanović	ivanjovanovic77@gmail.com	Full professor
2.	Gordana Radosavljević	perun.gr@gmail.com	Full professor
3.	Vladislav Volarević	drvolarevic@yahoo.com	Full professor
4.	Marija Milovanović	marijaposta@gmail.com	Full professor
5.	Jelena Pantić	panticjelena55@gmail.com	Associate professor
6.	Slađana Pavlović	sladjadile@gmail.com	Associate professor
7.	Aleksandar Arsenijević	aleksandar@medf.kg.ac.rs	Associate professor
8.	Nevena Gajović	gajovicnevena@yahoo.com	Assistant professor
9.	Vladimir Marković	vladimirmarkovic.vlad@gmail.com	Teaching assistant
10.	Isidora Stanisavljević	isidorastanisavljevic97@gmail.com	Junior teaching assistant

COURSE STRUCTURE:

Module	Name of the module	Week	Lectures weekly	Work in a small group per week	Teacher
1	Molecular basis of oncology	6	2	2	Ivan Jovanović
2	Etiology, progression and tumor immunology	9	2	2	
∑30+15=45					

EVALUATION:

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

PRE-EXAM ACTIVITY: In this way, the student can earn up to 30 points by actively participating in small group and answering questions related to this week's lesson. Based on demonstrated knowledge, the student can earn between 0-2 points per week.To pass the module, student needs to acquire more than 50% of the total points for that module (see table).
Students who do not earn more than 50% of the points in pre-exam activity will take the exam by answering 2 questions from each module that they have not passed.

FINAL EXAM: In this way, student can earn up to 70 points. Student takes the test which includes 70 questions that are covering the entire subject material. If the student does not achieve more than 50% correct answers, he/she has not passed the final exam.

The final grade is formed as follows:

In order to pass the course, the student must obtain a minimum of 51 points, pass pre-exam activities on all modules and pass the final exam (test).

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

LITERATURE:

The name of the textbook	Authors	Publisher	The library
Basic immunology: Functions and disorders of the Immune System, sixth edition	Abul K.Abbas and Andrew H. Lichtman	Elsevier Science. 2019	Has
The biology of cancer	Robert A. Weinberg	Garland Science, 2014	Has
The Molecular Basis of Cancer	John Mendelsohn, Peter M. Howley, Mark A. Israel, Joe W. Gray	ELSEVIER, Expert Consult, 2014	Has
Cancer, Principles and practice of Oncology	DaVita, Hellman, Rosenberg	Williams & Wilkins	Has
Il-33/ST2 axis, galectin 1 and 3 in colorectal pathology	*Marina Jovanovic, Milan Jovanovic*	*LAP LAMBERT Academic Publishing* 2022 ISBN: 978-620-5-49679-8	Has
Autophagy in health and disease-potential therapeutic approaches	Kursad Turksen	Humana Press Springer Nature 2018. ISBN: 978-3-319-98146-8	
Cytokine production in inflammatory diseases and malignancy of colon	*Jovanovic Marina, Jovanovic Milan*	*LAP LAMBERT Academic Publishing* 2019 ISBN: 978-620-0-08148-3	

The presentations and accompanying document in *Word* can be found on the website of the Faculty of Medical Sciences:www.medf.kg.ac.rs

PROGRAM

MODULE 1: MOLECULAR BASIS OF ONCOGENESIS

TEACHING UNIT 1 (FIRST WEEK)

PROLIFERATION AND DIFFERENTIATION

Proliferation
Phases of the cell cycle
Cell cycle regulation
Cyclins. Cyclin-dependent kinases. Inhibitors of cyclin-dependent kinases.
DNA damage control.
Differentiation.

TEACHING UNIT 2 (SECOND WEEK)

MECHANISMS OF CELL DEATH

Necrosis

- Mechanism, role and significance

Apoptosis

- Mechanism, role and significance
- Difference between apoptosis and necrosis
- Basic principles of receptor-mediated cell death (external signal)
- Basic principles of cell death due to loss of survival signals (internal signal)

Necroptosis
Autophagy

- Mechanism, role and significance

TEACHING UNIT 3 (THIRD WEEK)

SIGNALING PATHWAYS IN THE CELL

Biochemical activation pathways in the cell
Biochemical mediators
Transcription factors

- NFAT
- NFκB
- AP-1

TEACHING UNIT 4 (FOURTH WEEK)

ONCOGENES

Oncogenes. Protooncogenes.
PDGF
VEGF
Ras
c-myc
HER2/neu
Cyclin D
Bcl-2

TEACHING UNIT 5 (FIFTH WEEK)

TUMOR SUPPRESSOR GENES 1

Antioncogenes.
Tumor phenotype.
Retinoblastoma.
Loss of heterozygosity.
NF1 protein as a negative regulator of the Ras signaling pathway.
APC.
BRCA1 и BRCA2.

TEACHING UNIT 6 (SIXTH WEEK)

TUMOR SUPPRESSOR GENES 2

Inhibitors of cyclin-dependent kinases.
pRb- Guardian of the restriction point.
p53- Guardian of the genome.
Immortalization and oncogenesis

- Telomeres
- Telomerases

Apoptosis inhibition
Autophagy and oncogenesis

MODULE 2: ETIOLOGY, PROGRESSION AND TUMOR IMMUNOLOGY

TEACHING UNIT 7 (SEVENT WEEK)

PHYSICAL AND CHEMICAL ETIOLOGICAL FACTORS

Physical and chemical etiological factors in oncogenesis.
Types and mechanisms of action of ionizing radiation, ultraviolet radiation and chemical carcinogens.
Correlation between radiation dose, age, genetic predisposition and tumors.

TEACHING UNIT 8 (EIGHT WEEK)

ONCOGENIC VIRUSES

Transformation and basic characteristics of transformed cells.
Types and basic characteristics of RNA and DNA oncogenic viruses.
Mechanism of action of RNA oncogenic viruses.
Mechanism of action of DNA oncogenic viruses.

TEACHING UNIT 9 (NINTH WEEK)

TUMOR ANGIOGENESIS

Tumor vasculature.
Mechanisms of neoangiogenesis.
Mediators of angiogenesis

TEACHING UNIT 10 (TENTH WEEK)

INVASIVENESS AND METASTASIS

Basic principles of invasive tumor growth (invasiveness, cell mobility, intravasation).
Metastasis, genetic basis and mechanisms of metastasizing.
Basic principles of site-specific metastasis, survival of malignant cells in circulation, and growth in a distant organ.

TEACHING UNIT 11 (ELEVENTH WEEK)

TUMOR STEM CELLS

Stem cells.
Tumor stem cells, basic characteristics and role in carcinogenesis.

TEACHING UNIT 12 (TWELFTH WEEK)

INFLAMMATION AND ONCOGENESIS

Oncogenesis in inflammation tissue.
Cells involved in inflammatory reactions and stromal cells. Role in tumor initiation and progression

- Tumor associated fibroblasts
- Tumor associated macrophages

TEACHING UNIT 13 (THIRTEENTH WEEK)

METABOLISM OF TUMOR CELLS

Oncogenesis.
Tumor progression.
Tumor immunology.

TEACHING UNIT 14 (FOURTEENTH WEEK)

TUMOR IMMUNOTHERAPY 1

Non-specific immunotherapy.
Cytokines.
Monoclonal antibodies.
Vaccination.

TEACHING UNIT 15 (FIFTEENTH WEEK)

TUMOR IMMUNOTHERAPY 2

Tumor therapy with CAR T-CELLS, LAK and TIL cells
Tumor therapy with immune checkpoint inhibitors

LECTURE SCHEDULE

INSTITUTE FOR EMERGENCY MEDICAL ASSISTANCE

FRIDAY

08:00 – 09:30

SCHEDULE OF PRACTICE

R31	R32	R33
10:00 – 11:30	10:00 – 11:30	10:00 – 11:30
group I	group II	group III

module	week	type	Method unit name	Teacher
1	1	**L**	Proliferation and differentiation	**Prof. Dr Ivan Jovanović**
		P		Prof. Dr Ivan Jovanović Assoc.Prof. Dr Slađana Pavlović Assis. Prof. Dr Nevena Gajović
	2	**L**	Mechanisms of cell death	**Prof. Dr Ivan Jovanović**
		P		Prof. Dr Ivan Jovanović Dr Vladimir Marković Assoc.Prof. Dr Slađana Pavlović
	3	**L**	Signaling pathways in the cell	**Prof. Dr Jelena Pantić**
		P		Prof. Dr Jelena Pantić Dr Vladimir Marković Prof. Dr Gordana Radosavljević
	4	**L**	Oncogenes	**Prof. Dr Jelena Pantić**
		P		Prof. Dr Jelena Pantić Prof. Dr Gordana Radosavljević Assoc.Prof. Dr Slađana Pavlović
	5	**L**	Tumor suppressor genes 1	**Assoc. Prof. Dr Aleksandar Arsenijević**
		P		Assoc. Prof. Dr Aleksandar Arsenijević Dr Vladimir Marković Prof. Dr Gordana Radosavljević
	6	**L**	Tumor suppressor genes 2	**Assoc.Prof. Dr Slađana Pavlović**
		P		Assoc. Prof. Dr Slađana Pavlović Assis. Prof. Dr Nevena Gajović Prof. Dr Ivan Jovanović
2	7	**L**	Physical and chemical etiological factors	**Prof. Dr Marija Milovanović**
		P		Prof. Dr Marija Milovanović Assoc. Prof. Dr Aleksandar Arsenijević Prof. Dr Vladislav Volarević
	8	**L**	Oncogenic viruses	**Prof. Dr Marija Milovanović**
		P		Prof. Dr Marija Milovanović Dr Vladimir Marković Assoc. Prof. Dr Aleksandar Arsenijević

module	week	type	Method unit name	Teacher
2	9	**L**	Tumor angiogenesis	**Prof. Dr Gordana Radosavljević**
		P		Prof. Dr Gordana Radosavljević Dr Vladimir Marković Prof. Dr Jelena Pantić
	10	**L**	Invasiveness and metastasis	**Prof. Dr Gordana Radosavljević**
		P		Prof. Dr Gordana Radosavljević Dr Vladimir Marković Prof. Dr Jelena Pantić
	11	**L**	Tumor stem cells	**Prof. Dr Vladislav Volarević**
		P		Prof. Dr Vladislav Volarević Prof. Dr Marija Milovanović Assoc. Prof. Dr Aleksandar Arsenijević
	12	**L**	Inflammation and metastasis	**Assoc.Prof. Dr Slađana Pavlović**
		P		Assoc. Prof. Dr Slađana Pavlović Prof. Dr Ivan Jovanović Assis. Prof. Dr Nevena Gajović
	13	**L**	Metabolism of tumor cells	**Assoc. Prof. Dr Aleksandar Arsenijević**
		P		Assoc. Prof. Dr Aleksandar Arsenijević Prof. Dr Vladislav Volarević Prof. Dr Marija Milovanović
	14	**L**	Tumor immunotherapy 1	**Assis. Prof. Dr Nevena Gajović**
		P		Assis. Prof. Dr Nevena Gajović Dr Vladimir Marković Prof. Dr Marija Milovanović
	15	**L**	Tumor immunotherapy 2	**Assis. Prof. Dr Nevena Gajović**
		P		Assis. Prof. Dr Nevena Gajović Prof. Dr Jelena Pantić Prof. Dr Ivan Jovanović
		E	**FINAL EXAM**	