

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	BIOKEMIJA RAKA
<b>Course Title:</b>	BIOCHEMISTRY OF CANCER

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
MAG Biokemija, 2. stopnja	/	1.	1.
USP Biochemistry, 2 <sup>nd</sup> Cycle	/	1 <sup>st</sup>	1 <sup>st</sup>

**Vrsta predmeta / Course Type:**

izbirni strokovni / Elective Professional

**Univerzitetna koda predmeta / University Course Code:**

BI2104

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
30	15	30 LV	/	/	75	5

**Nosilec predmeta / Lecturer:**

doc. dr. Barbara Breznik / Dr. Barbara Breznik, Assistant Professor

**Jeziki / Languages:**

**Predavanja / Lectures:** slovenski / Slovenian

**Vaje / Tutorial:** slovenski / Slovenian

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

**Prerequisites:**

The course has to be assigned to the student.

**Vsebina:**

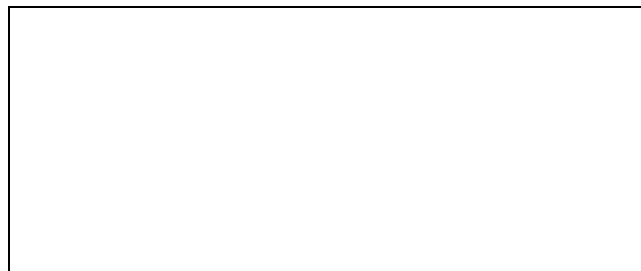
Sklopi predavanj:

1. Uvod
2. Razvoj malignih obolenj (kancerogeneza, celični cikel, apoptoza)
3. Genetske osnove bolezni
4. Virusi, onkogeni in tumorski supresorski gen
5. Prenos signalov, eksperimentalne metode v onkologiji
- 6-a. Napredovanje tumorjev I (interakcije tumorjev z okoljem, invazija) 6-b. Napredovanje tumorjev II (Angiogeneza metastaziranje)
7. Tumorska proteoliza

**Content (Syllabus outline):**

1. Introduction to cancer biology and biochemistry
2. Malignant disease initiation (carcinogenesis, cell cycle and apoptosis) and experimental methods in cancer research.
3. Molecular basis of carcinogenesis
4. Viruses and tumour suppressor genes.
5. Oncogenes and signal transduction
6. Tumour progression: microenvironment and invasion, proteolysis
7. Tumour progression: metastases and angiogenesis
8. Stem cells in tumor progression
9. Anti-tumour immune response
10. Epidemiology, tumour biomarkers
11. Therapeutic approaches in cancer

- 8. Protitumorski imunski odziv
- 9. Epidemiologija, tumorski kazalci, diagnoza, prognoza
- 10. Terapija rakavih obolenj (kemoterapija, radioterapija, genska terapija, biofarmacevtiki v terapiji raka, dostavni sistemi)



**Temeljna literatura in viri / Readings:**

- Weinberg, RA: The Biology of Cancer, druga izdaja, W. W. Norton & Company (2014), ISBN-10: 0815345299 - izbrana poglavja
- Tannock IF, Hill RP, Bristow RG, Harrington L: The Basic Science of Oncology, peta izdaja, McGraw-Hill (2013), ISBN-10: 0071745203
- Pregledni članki /Reviews iz Nature Cancer Reviews in Cancer Research
- ČEMAŽAR, Maja, SERŠA, Gregor, MOTALN, Helena, VERBOVŠEK, Urška, TODORVIČ, Vesna, LAH TURNŠEK, Tamara. Biologija raka : navodila za vaje. Ljubljana: [s. n.], 2013. 42 str., ilustr. [COBISS.SI-ID 2919503]

**Cilji in kompetence:**

Študent spozna osnove biologije tumorjev in eksperimentalne onkologije v luči uporabe v biomedicini. Osvoji znanja o molekularnih spremembah, ki so odgovorne za nastanek maligno transformirane celic in specifičnih bioloških lastnosti tumorskih celic. Spozna biološke osnove nastanka in napredovanja tumorjev ter spozna osnovne principe zdravljenja v onkologiji. Študent pridobi tudi osnovna znanja o epidemiologiji in spozna najnovejša dognanja v diagnostiki in novih ciljanih bioloških terapijah raka. Pridobljena teoretična in praktična znanja dajejo študentom osnovo za delo v različnih biomedicinskih laboratorijih, tako diagnostičnih kot raziskovalnih.

**Objectives and Competences:**

- The goal of study subject is that the student gets familiar with biology and molecular mechanisms of the disease- cancer progression. He also gets the basis in experimental oncology within a broader aspect of biomedicine.
- The student acquires knowledge on biochemical processes and changes that are responsible for appearance of malignant transformed cells and their specific biological properties.
- The student learns about biological basis of cancer initiation and progression of tumours and possible treatments modalities.
- The student also learns about epidemiology and prevention of cancer, as well as latest diagnostics tools and targeted biological therapies in broader he light of personalised medicine.
- The acquired theoretical and practical knowledge give the student the basis for the potential work in biomedical laboratories, being research or in clinics.

**Predvideni študijski rezultati:**

Znanje in razumevanje  
 Slušatelji bodo pridobili znanje o specifičnih lastnostih rakavih celic in pristopih zdravljenja

**Intended Learning Outcomes:**

Knowledge and Comprehension  
 The students will get the knowledge on  
 - cancer incidence

raka:.	- specific properties of tumours and clinical aspect of disease progression - prevention and - therapeutic approaches.
<u>Uporaba</u> Študentje bodo uporabljali pridobljena znanje za razumevanje vse večje razširjenosti raka ter kakšni so problemi pri zdravljenju te bolezni. Nadalje, kateri so novi pristopi zdravljenja in kako načrtovati bazične in translacijske raziskave v predklinični onkologiji.	<u>Application</u> The students will use the acquired knowledge for understanding of cancer prevalence. The understanding of problems of the disease incidence and therapy approaches are relevant for a broader knowledge. The knowledge on the principles of planning basic and translational research has a wider application in applied biochemistry and biomedicine,
<u>Refleksija</u> Kritično ovrednotenje pridobljenega teoretičnega in praktičnega znanja o biologiji raka z nadaljnjim delom v raziskovalnih ali rutinskih laboratorijih.	<u>Analysis</u> The appreciation of the impact of even small molecular changes in the development and spread of the diseases- cancer is very relevant for understanding and analyses of other diseases that are or are not related to cancer. It also leads to better understanding of similar disciplines such as pharmacy and medicine in general.
<u>Prenosljive spretnosti</u> Razumevanje temeljnih zakonitosti biologije raka z osnovami diagnostike in zdravljenja raka bo omogočilo študentom spoznavanje in reševanje problemov s tega področja ter uspešno timsko delo s strokovnjaki z drugih medicinskih in biomedicinskih področij.	<u>Skill-transference Ability</u> The understanding of basic cancer biology for biochemistry students can be transferred to application in biomarkers research for diagnosis and as targets for therapy in drugs design. The critical evaluation of the acquired theoretical and practical knowledge on cancer biology is relevant for potential future work in research or industry.

**Metode poučevanja in učenja:**

Predavanja (30)  
Seminar (15)  
Vaje (30)

**Learning and Teaching Methods:**

Lectures. 30 hours  
Seminars (by students), 15 hours  
Practical courses, 30 hours

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

Seminar  
Pisni izpit  
Ocene: 6-10 (pozitivno), 1-5 (negativno).

Seminar  
Written exam  
Grades: 6-10 (positive), 1-5 (negative)

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**Reference nosilca / Lecturer's references:**

- MAJC, Bernarda, HABIČ, Anamarija, NOVAK, Metka, ROTTER, Ana, PORČNIK, Andrej, MLAKAR, Jernej, ŽUPUNSKI, Vera, PEČAR FONOVIĆ, Urša, KNEZ, Damijan, ZIDAR, Nace, GOBEC, Stanislav, KOS, Janko, LAH TURNŠEK, Tamara, PIŠLAR, Anja, **BREZNIK, Barbara**. Upregulation of cathepsin X in glioblastoma : interplay with  $\gamma$ -enolase and the effects of selective cathepsin X inhibitors. International journal of molecular sciences. 2022, vol. 23, iss. 3, str. 1-22.
- PORČNIK, Andrej, NOVAK, Metka, **BREZNIK, Barbara**, MAJC, Bernarda, HRASTAR, Barbara, ŠAMEC, Neja, ZOTTEL, Alja, JOVCHEVSKA, Ivana, VITTORI, Miloš, ROTTER, Ana, KOMEL, Radovan, LAH TURNŠEK, Tamara. TRIM28 selective nanobody reduces glioblastoma stem cell invasion. Molecules. Aug. 2021, vol. 26, iss. 17, str. 1-16, ilustr. ISSN 1420-3049.  
<https://www.mdpi.com/1420-3049/26/17/5141>, DOI: 10.3390/molecules26175141.
- LAH TURNŠEK, Tamara, NOVAK, Metka, **BREZNIK, Barbara**. Brain malignancies : glioblastoma and brain metastases. Seminars in cancer biology. [Print ed.]. 2020, vol. 60, str. 262-273.