

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

**Predmet:** BIOKEMIJA VEČCELIČNIH SISTEMOV  
**Course Title:** BIOCHEMISTRY OF HETEROCELLULAR SYSTEMS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
MAG Biokemija, 2. stopnja	/	2.	3.
USP Biochemistry, 2 <sup>nd</sup> Cycle	/	2 <sup>nd</sup>	3 <sup>rd</sup>

**Vrsta predmeta / Course Type:**

obvezni / Mandatory

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

BI2T02

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:**

izr. prof. dr. Marko Novinec / Dr. Marko Novinec, Associate 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:**

Celice v socialnem kontekstu: medcelični stiki, stiki celica-matriks, medcelična komunikacija, prenos signalov iz ECM v celico, migracije.

Struktura in komponente matriksa: fizikalno-kemijske lastnosti ECM, kolageni, elastična vlakna, glikoproteini, proteoglikani, glikozaminoglikani, bazalne membrane, mehanske lastnosti matriksa.

Eksperimentalne metode pri študiju ECM: izolacija komponent, analiza in detekcija komponent ECM.

Dinamika zunajceličnih procesov: sinteza komponent matriksa, procesi preoblikovanja

**Content (Syllabus outline):**

Cells in their social context: cell junctions, cell-extracellular matrix (ECM) interactions, intercellular communication, transmission of signals from the ECM into the cell, migrations. Structure and components of the ECM: physical and chemical properties, collagens, elastic fibers, glycoproteins, proteoglycans, glycosaminoglycans, basal membranes, mechanical properties of the ECM. Experimental methods in ECM studies: purification, analysis and detection of ECM components.

Dynamics of extracellular processes: synthesis of ECM components, ECM turnover (angiogenesis, bone formation, etc.) ECM-ECM

matriksa (angiogeneza, tvorba kosti ...), interakcije matriks-matriks, matricelične interakcije, matrikini.

Tkiva in organi: splošne lastnosti različnih vrst tkiv in organov, specializirane oblike matriksa (ledvica, mielin, itd.), razvojna biologija tkiv, vrste tkiv in matriksa pri različnih evolucijskih skupinah živali.

Encimska aktivnost izven celic: zunajcelične peptidaze (metalo-peptidaze, serinske peptidaze, cisteinski katepsini), glikozidaze, sekretorne fosfolipaze, zunajcelična superoksid-dismutaza.

Patološke spremembe ECM: rakasta obolenja, obolenja krvno-žilnega sistema, obolenja dihal, revmatoidni artritis, osteoartroza, osteoporoza, staranje.

interactions, matricellular interactions, matrikines.

Tissues and organs: basic properties of different types of tissues and organs, specialized ECM structures (kidney, myelin, etc.), tissue developmental biology, types of tissue and ECM in different evolutionary lineages of animals. Enzyme activity outside the cell: extracellular peptidases (metallopeptidases, serine peptidases, cysteine cathepsins), glycosidases, secretory phospholipases, extracellular superoxide dismutase.

Pathological ECM changes: cancer, cardiovascular diseases, pulmonary diseases, rheumatoid and osteoarthritis, osteoporosis, ageing.

#### **Temeljna literatura in viri / Readings:**

- Molecular Cell Biology, Lodish. H et al., 2008, W.H. Freeman and Company, NY, 1150 strani (801-845).
- The Extracellular Matrix: an Overview, Mecham RP, 2011, Springer, strani 400 (60%).

#### **Cilji in kompetence:**

Predmet obravnava zunajcelični prostor (ECM) z vidika njegove organizacije, biomehanskih lastnosti in pretvorbe ter metod njegovega preučevanja. Študenti bodo povezali dosedanje znanje s tistim, ki ga bodo pridobili pri tem predmetu, tako da bodo sposobni na molekularnem nivoju interpretirati spremembe ECM, ki nastanejo kot posledica rasti, staranja in bolezni.

#### **Objectives and Competences:**

The course discusses the extracellular space (ECM) from the perspectives of its organisation, biomechanical properties and conversion, as well as the methods used in ECM research. Students will integrate prior knowledge with new knowledge and will be able to interpret the molecular basis of ECM changes that occur during growth, ageing and disease.

#### **Predvideni študijski rezultati:**

##### Znanje in razumevanje

Študenti pridobijo znanje o biokemijskih lastnostih in sestavi ECM, o procesih njegovega nastajanja, organizacije in preoblikovanja ter spremembah, povezanih z razvojem različnih bolezni. Pridobljeno znanje jim v povezavi s predhodnim znanjem omogoča razumevanje znanstvenega pristopa preučevanja ECM in strategij zdravljenja

#### **Intended Learning Outcomes:**

##### Knowledge and Comprehension

Students gain knowledge of the biochemical properties and composition of the ECM, and of the processes involved in its synthesis, organisation, remodelling and pathological changes. Together with prior knowledge this enables students to understand experimental approaches used to study the ECM and the strategies used for treatment of various

nekaterih bolezni.	diseases.
<u>Uporaba</u> Pridobljeno znanje je podlaga za delo na področjih biokemije, celične biologije, biomedicine, histologije, itd.	<u>Application</u> The obtained knowledge is the basis for successful work in the fields of biochemistry, cell biology, biomedicine, histology, etc.
<u>Refleksija</u> Študenti reflektirajo prej pridobljene teoretične in praktične osnove in jih povežejo s pridobljenim znanjem.	<u>Analysis</u> Students reflect on prior knowledge and integrate it with new knowledge.
<u>Prenosljive spretnosti</u> Vsebina predmeta je tesno povezana in nadgrajuje študentovo znanje iz biokemije, celične biologije, fiziologije. Spodbuja sposobnost uporabe literature, reševanja zadanih nalog, interpretacije rezultatov ter ustnega in pisnega sporočanja.	<u>Skill-transference Ability</u> The course is linked to and increases the students' prior knowledge of biochemistry, cell biology and physiology. It facilitates the students' abilities to use literature, solve problems, interpret results and report orally and in writing.

**Metode poučevanja in učenja:**

Predavanja, raziskovalni seminarji, projektno delo in vaje.

**Learning and Teaching Methods:**

Lectures, research seminars, project work, practical tutorial.

**Načini ocenjevanja:**

Kolokvij iz laboratorijskih vaj  
Seminarska naloga  
Pisni izpit

Delež (v %) /

Weight (in %) /

**Assessment:**

Laboratory tutorial colloquium  
Seminar work  
Written examination

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

- KLEMENČIČ, Marina, **NOVINEC, Marko**, MAIER, Silke, HARTMANN, Ursula, LENARČIČ, Brigita. The heparin-binding activity of secreted modular calcium-binding protein 1 (SMOC-1) modulates its cell adhesion properties. PloS one, ISSN 1932-6203, 2013, vol. 8, no. 2, art. no. e56839  
- **NOVINEC, Marko**, LENARČIČ, Brigita, BAICI, Antonio. Clusterin is a specific stabilizer and liberator of extracellular cathepsin K. FEBS letters, ISSN 0014-5793. [Print ed.], 2012, vol. 586, no. 7, p. 1062-1066  
- **NOVINEC, Marko**, GRASS, Robert N., STARK, Wendelin J., TURK, Vito, BAICI, Antonio, LENARČIČ, Brigita. Interaction between human cathepsins K, L, and S, Mechanism of elastinolysis and inhibition by macromolecular inhibitors. The Journal of biological chemistry, ISSN 0021-9258, 2007, vol. 282, no. 11, p. 7893-78902.