

# BIOMAKROMOLEKULE V INDUSTRIJI IN MEDICINI

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Biomakromolekule v industriji in medicini
<b>Course title:</b>	Biomacromolecules in industry and medicine
<b>Članica nosilka/UL</b>	UL FKKT
<b>Member:</b>	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Biokemija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code: 0640060

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	15	30 LV			75	5

Nosilec predmeta/Lecturer: doc. dr. Miha Pavšič

Vrsta predmeta/Course type: izbirni strokovni/Elective Professional

Jeziki/Languages:

Predavanja/Lectures:	Angleščina, Slovenščina
Vaje/Tutorial:	Angleščina, Slovenščina

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

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.
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### Vsebina:

Pridobivanje in proizvodnja proteinov ter drugih bioloških makromolekul – naravni viri, pregled sistemov za proizvodnjo rekombinantnih proteinov v velikem merilu, priprava polisaharidov.  
Posebni biopolimeri – polihidroksialkanoati, poliaminokislinae.  
Modifikacija (kemijske, metabolične in post-translacijske modifikacije) in funkcionalizacija biomakromolekul ter proteinski inženiring (usmerjena evolucija, dizajn de novo) z namenom doseganja specifičnih lastnosti (katalitična aktivnost, stabilnost, vezava).  
Encimi kot biokatalizatorji – proizvodnja hrane in pijač, biogoriv, tekstila in čistil.  
Uporaba biomakromolekul v medicini – tkivni inženiring, regenerativna medicina, 3D-tiskanje bioaktivnih struktur, terapevtske učinkovine in

### Content (Syllabus outline):

Extraction and production of proteins and other biological macromolecules – natural sources, overview of systems for large scale recombinant protein production, production of polysaccharides.  
Special biopolymers – polyhydroxyalkanoates, polyamino acids.  
Modification (chemical, metabolic and post-translational modifications) and functionalization of biomacromolecules, and protein engineering (directed evolution, design de novo) with the aim to deliver specific properties (catalytic activity, stability, binding).  
Enzymes as biocatalysts – production of food and beverages, biofuels, textile and cleaning agents.  
Biomacromolecules in medicine – tissue engineering, regenerative medicine, 3D printing of bioactive structures, pharmaceuticals and drug delivery.

<p>dostava zdravil.</p> <p>Biopolimeri v industriji in agronomiji – prehrabena industrija (hrana in pakiranje hrane), moderni materiali, zaščita semen in rastlin, hranila, uporaba v živiloreji.</p> <p>Biomakromolekule in okoljske tehnologije – biorazgradljivost, remediacija okolja in trajnostni vidiki.</p> <p>Patenti in inovacije v biotehnologiji ter zaščita intelektualne lastnine.</p>	<p>Biopolymers in industry and agriculture – food industry (food and food packaging), modern materials, protection of seeds and plants, livestock feed and farming.</p> <p>Biomacromolecules and environmental technologies – biodegradability, remediation and sustainability.</p> <p>Patents and innovations in biotechnology, and protection of intellectual property.</p>
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### Temeljna literatura in viri/Readings:

<p>Temeljna literatura in viri / Readings:</p> <ul style="list-style-type: none"> <li>- Navodila za vaje in tekoča znanstvena literatura. / Protocols for practicals and current scientific literature.</li> <li>- Gary Walsh. Proteins: Biochemistry and Biotechnology. 2. izdaja. Wiley Blackwell, 2014.</li> <li>- Wolfgang Aehle. Enzymes in Industry: Production and Applications. 3. izdaja. Wiley, 2007. (izbrana poglavja / selected chapters)</li> <li>- Sabu Thomas, Sreeraj Gopi, Augustine Amalraj. Biopolymers and Their Industrial Applications: From Plant, Animal, and Marine Sources, to Functional Products. 1. izdaja. Wiley, 2020. (izbrana poglavja / selected chapters)</li> </ul>
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### Cilji in kompetence:

<p>Predmet daje pregled uporabe biomakromolekul v različnih vejah industrije, medicini in tudi v vsakdanjem življenju. Po opravljenih obveznostih bodo študenti znali kritično ovrednotiti prednosti biomakromolekul z vidika njihove priprave, posebnih funkcionalnosti in okoljskih vidikov.</p>	<h3>Objectives and competences:</h3> <p>The subject provides an overview of the use of biomacromolecules in various industrial branches, medicine and also in everyday life. Upon completing the course, the students will be able to critically evaluate the advantages of biomacromolecules from the production, functional and environmental aspects.</p>
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### Predvideni študijski rezultati:

<p><b>Znanje in razumevanje</b> Poznavanje načinov pridobivanja bioloških makromolekul, njihovih prednosti in načinov uporabe.</p> <p><b>Uporaba</b> Pridobljeno znanje predstavlja razširitev osnovnega biokemijskega znanja s poudarkom na industrijski in medicinski vrednosti biomakromolekul.</p> <p><b>Refleksija</b> Študenti bodo zraven navedenega znanja pridobili sposobnost kritičnega razmišljanja o aplikativnih vidikih.</p> <p><b>Prenosljive spretnosti</b> Samostojno in skupinsko delo na vajah ter pri pripravi seminarjev, sposobnost uporabe znanstvene literature in drugih virov, predstavljanje in debatiranje.</p>	<h3>Intended learning outcomes:</h3> <p><b>Knowledge and Comprehension</b> Knowledge on production of biological macromolecules, their advantages and use.</p> <p><b>Application</b> Acquired knowledge broadens the basic biochemical knowledge with emphasis on industrial and medical value of biomacromolecules.</p> <p><b>Analysis</b> Students will, besides gaining the listed knowledge, develop ability to critically think about applicative aspects.</p> <p><b>Skill-transference Ability</b> Individual and group work at practicals and at seminar preparation, ability to use scientific literature and other sources, presentation and debating.</p>
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### Metode poučevanja in učenja:

<p>Predavanja, laboratorijske vaje, individualni in skupinski seminarji.</p>	<h3>Learning and teaching methods:</h3> <p>Lectures, laboratory practicals, and individual and group seminars.</p>
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### Načini ocenjevanja:

### Delež/Weight Assessment:

Seminarska naloga in pisni izpit. Pogoj za pristop k izpitu so opravljene vaje in seminarska naloga.	Completed laboratory practicals and seminar work is a prerequisite for admission to the examination.
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**Reference nosilca/Lecturer's references:**

KRAJNC, Anja, GABER, Aljaž, LENARČIČ, Brigita, **PAVŠIČ, Miha**. 2020. The Central Region of Testican-2 Forms a Compact Core and Promotes Cell Migration. *International Journal of Molecular Sciences*. 2020. DOI 10.3390/ijms21249413. ISSN 1661-6596. [COBISS.SI-ID 42261507]

GABER, Aljaž, GUNČAR, Gregor, **PAVŠIČ, Miha**. Proper Evaluation of Chemical Cross-Linking-Based Spatial Restraints Improves the Precision of Modeling Homo-Oligomeric Protein Complexes. *BMC Bioinformatics*. 2019, vol. 20 (1): 464. DOI 10.1186/s12859-019-3032-x. ISSN 1471-2105. [COBISS.SI-ID 1538315971]

**PAVŠIČ, Miha**, GUNČAR, Gregor, DJINOVIĆ-CARUGO, Kristina, LENARČIČ, Brigita. Crystal Structure and Its Bearing towards an Understanding of Key Biological Functions of EpCAM. *Nature Communications*. 2014, 5: 4764. DOI 10.1038/ncomms5764. ISSN 2041-1723. [COBISS.SI-ID 1764911]