

2026/2027

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	<b>Biotehnologija in genetika</b>
<b>Course title:</b>	<b>Biotechnology and Genetics</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Farmacija, 2. stopnja		2.	3.
Pharmacy, 2. level		2.	3.

**Vrsta predmeta / Course type** obvezni/obligatory

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	15	15			90	5

**Nosilec predmeta / Lecturer:** Prof. dr. Uroš Potočnik

**Jeziki / Predavanja / Lectures:** slovenski/slovene  
**Languages: Vaje / Tutorial:** slovenski/slovene

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

**Vsebina:**

**Biotehnologija:**

- Tehnologija rekombinantne DNA.
- Najpomembnejši rekombinantni biofarmaceutiki.
- Priprava in uporaba monoklonskih protiteles.
- Gensko zdravljenje rakavih in ostalih obolenj.
- Sistemi vnosa genov v organizem.
- Tehnologija CRISPR/CAS
- Terapija z matičnimi celicami

**Genetika:**

- Vloga genetike v farmaciji.
- Struktura in vloga nukleinskih kislin.
- Geni in kromosomi.
- Organizacija človeškega genoma, projekt človeškega genoma.
- Kromosomska teorija dednosti.
- Razvoj molekularnih markerjev.
- Transkripcijsko uravnavanje genske ekspresije.
- Mehanizmi zgodnje diferenciacije celic.
- Signalna transdukcija
- Genomika in proteomika
- Molekularno genetske osnove raka
- Uvod v farmakogenomiko in personalizirano medicino

**Content (Syllabus outline):**

**Biotechnology:**

- Recombinant DNA technology.
- The most important recombinant biopharmaceuticals.
- Preparation and use of monoclonal antibodies.
- Gene therapy of cancer and other diseases.
- Introduction to gene delivery into the body.
- CRISPR/CAS technology
- Stem cell therapy

**Genetics:**

- The role of genetics in pharmacy.
- Structure and role of nucleic acids.
- Genes and chromosomes
- Organization of human genome, Human Genome Project
- Chromosomal mechanisms of inheritance.
- Development of genetic markers.
- Regulation of gene expression with transcription,
- Mechanisms of early cell differentiation.
- Signal transduction
- Genomics and proteomics
- Molecular genetics of cancer

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- Bioinformatika v genetiki

- Introduction to pharmacogenomics and personalized medicine
- Bioinformatics in genetics

**Temeljni literatura in viri / Readings:**

**TEMELJNA LITERATURA:**

1. Sandy B. Primrose, By (author) Richard Twyman : Principles of Gene Manipulation and Genomics; 8th Revised edition; Wiley-Blackwell (an imprint of John Wiley & Sons Ltd), 2016.

**DODATNA LITERATURA:**

1. Crommelin J.A., Sindelar R.D., Meibohm, B.: Pharmaceutical Biotechnology, 4th edition. Springer, 2016.
2. Pevsner J. Bioinformatics and functional genomics. 3rd ed. Chichester: Wiley Blackwell; 2015.
3. Dudley JT, Karczewski KJ. Exploring personal genomics. Oxford: Oxford University Press; 2013.

**Cilji in kompetence:**

- Pridobiti znanja molekularne biologije, molekularne genetike in predvsem razumevanje novih načinov terapij in tarč, ki izhajajo iz spoznavanja človeškega genoma.
- Spoznavanje najpomembnejših kompleksnih zdravilnih učinkovin iz področja biofarmacevtikov.

**Objectives and competences:**

- Acquire knowledge of molecular biology, molecular genetics and understanding of novel approaches to gene therapy derived from human genome sequencing.
- Getting to know the most important active substances in the field of biopharmaceuticals.

**Predvideni študijski rezultati:**

**Intended learning outcomes:**

Znanje in razumevanje:

Študenti znajo opisati in razložiti sodobne biofarmacevtske, biotehnološke in biomedicinske pristope, ki so osnovani na DNA tehnologiji. Znajo razložiti sestavo in delovanje biofarmacevtikov in uporabo genske terapije. S pridobljenim znanjem o biofarmacevtikih in njihovem delovanju na molekularnem nivoju znajo utemeljiti njihove terapevtske učinke in pojavnost neželenih učinkov.

Študenti so sposobni razlikovati zgradbo genomov ter strukturo in funkcijo transkripcijskih enot pri prokariotih in evkariontih. Znajo analizirati DNA-sekvence in predvideti, kako bi se določen odsek DNA izrazil, in kako bi na izražanje vplivale različne DNA-mutacije. Znajo povezati spremembe v strukturi in funkciji biomolekul, ki sodelujejo v biokemijskih procesih človeškega telesa, s pojavom bolezenskih stanj. Poglobljeno razumejo načine komunikacij med celicami. Sposobni so argumentirati uporabnost različnih "omik" (genomika, transkriptomika, proteomika, epigenomika, metabolomika) v biomedicini in biofarmaciji.

Prenesljive/ključne spretnosti in drugi atributi:

- Študenti znajo poiskati genomske, farmakogenomske in druge podatke po svetovnih bazah podatkov in jih aplicirati v prakso (iskanje primerov).

Knowledge and understanding:

Students are able to describe and explain modern biopharmaceutical, biotechnological and biomedical approaches that are based on DNA technology. They are able to explain the composition and function of biopharmaceuticals and the use of gene therapy. By acquiring knowledge of biopharmaceuticals and their activity at the molecular level, they are able to interpret the therapeutic effects of biopharmaceuticals and the possibility of adverse reactions.

Students are able to distinguish between the structure of genomes and the structure and function of transcriptional units in prokaryotes and eukaryotes. They are able to analyze DNA sequences and predict how a particular stretch of DNA is likely to be expressed and how expression would be affected by different DNA mutations. They are able to associate changes in the structure and function of biomolecules involved in the biochemical processes of the human body to the occurrence of disease states. They gain a deeper understanding of cell-to-cell communication. They are able to argue the applicability of different "omics" (genomics, transcriptomics, proteomics, epigenomics, metabolomics) in biomedicine and biopharmaceutics.

Transferable/key skills and other attributes:

- Students are able to search genomic, pharmacogenomic and other data in global

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	databases and apply them in practice (case search).
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**Metode poučevanja in učenja:**

**Learning and teaching methods:**

<p>Predavanja Seminarji (seminarske naloge) Vaje</p> <p>V okviru seminarjev se bodo obravnavale aktualne teme s področja predmeta</p>	<p>Lectures Seminars (tutorials) Tutorials</p> <p>The seminars will cover trending topics in the subject area</p>
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**Delež (v %) /**

**Weight (in %) /**

**Načini ocenjevanja:**

**Assessment:**

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt)</p> <ul style="list-style-type: none"> <li>seminarska naloga</li> <li>pisni izpit</li> </ul> <p>ŠTUDIJSKE OBVEZNOSTI ŠTUDENTOV</p> <ul style="list-style-type: none"> <li>80 % prisotnost na vajah in seminarjih in priprava seminarske naloge</li> </ul> <p>POGOJ ZA PRISTOP K IZPITU</p> <ul style="list-style-type: none"> <li>Opravljene vaje so pogoj za pristop k izpitu</li> <li>Opravljena seminarska naloga</li> </ul>	<p><b>40 %</b></p> <p><b>60 %</b></p>	<p>Type (examination, oral, coursework, project):</p> <ul style="list-style-type: none"> <li>seminar paper</li> <li>written exam</li> </ul> <p>ACADEMIC OBLIGATIONS OF STUDENTS</p> <ul style="list-style-type: none"> <li>80 % attendance at tutorials and seminars, as well as prepared coursework</li> </ul> <p>CONDITIONS FOR TAKING THE EXAM</p> <ul style="list-style-type: none"> <li>Completed tutorials</li> <li>Completed coursework</li> </ul>
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**Reference nosilca / Lecturer's references:**

**UROŠ POTOČNIK:**

- GORENJAK, Mario, ZUPIN, Mateja, JEZERNIK, Gregor, SKOK, Pavel, POTOČNIK, Uroš. Omics data integration identifies ELOVL7 and MMD gene regions as novel loci for adalimumab response in patients with Crohn's disease. Scientific reports, ISSN 2045-2322, 2021, vol. 11, str. 1-12, ilustr. <https://www.nature.com/articles/s41598-021-84909-z>, <https://doi.org/10.1038/s41598-021-84909-z>, doi: 10.1038/s41598-021-84909-z. [COBISS.SI-ID 54882051], [JCR, SNIP, WoS do 28. 7. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0.40, Scopus do 30. 4. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0.40] kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICBtočke: 20.99, št. avtorjev: 5
- JEZERNIK, Gregor, GORENJAK, Mario, POTOČNIK, Uroš. Gene ontology analysis highlights biological processes influencing non-response to anti-TNF therapy in rheumatoid arthritis. Biomedicines, ISSN 2227-9059. [Online ed.], 2022, vol. 10, issue 8, str. [1]-27, ilustr. <https://doi.org/10.3390/biomedicines10081808>, <https://www.mdpi.com/2227-9059/10/8/1808>, doi: 10.3390/biomedicines10081808. [COBISS.SI-ID 116944899], [JCR, SNIP] kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela še ni verificiran točke: 38.88, št. avtorjev: 3
- AVBELJ, Monika, HAFNER BRATKOVIČ, Iva, LAINŠČEK, Duško, MANČEK KEBER, Mateja, PETERNELJ, Tina Tinkara, PANTER, Gabriela, TREON, Steven P., GOLE, Boris, POTOČNIK, Uroš, JERALA, Roman. Cleavage-mediated regulation of Myd88 signaling by inflammasome-activated caspase-1. Frontiers in immunology, ISSN 1664-3224, Jan. 2022, vol. 12, str. 1-14, ilustr. <https://www.frontiersin.org/articles/10.3389/fimmu.2021.790258/full>, <https://doi.org/10.3389/fimmu.2021.790258>, doi: 10.3389/fimmu.2021.790258. [COBISS.SI-ID 93261315], [JCR, SNIP, WoS do 14. 7. 2022: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.10, Scopus do



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23. 7. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0.20] kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICM točke: 11.45, št. avtorjev: 10