UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	MOLEKULARNA BIOLOGIJA
Course Title:	MOLECULAR BIOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UN Biokemija, 1. stopnja	**/**	**2.**	**4.**
USP Biochemistry, 1st Cycle	**/**	**2nd**	**4th**

Vrsta predmeta / Course Type: obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: BK119

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	**20**	**10 LV**	**/**	**/**	**75**	**5**

Nosilec predmeta / Lecturer: izr. prof. dr. Marko Dolinar / Dr. Marko Dolinar, Associate Professor

Jeziki / Languages:

Predavanja / Lectures:	**slovenski / Slovenian**
Vaje / Tutorial:	**slovenski / Slovenian**

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.

Vsebina:	Content (Syllabus outline):
1. Mehanizem podvojevanja DNA 2. Mutacije in popravljanje okvar na DNA 3. Homologna rekombinacija 4. Transkripcija in posttranskripcijski procesi 5. Genetski kod in tRNA 6. Biosinteza proteinov 7. Struktura kromosomov in organizacija genoma 8. Kontrola izražanja pri prokariontih 9. Kontrola izražanja pri evkariontih 10. Usmerjanje proteinov in posttranslacijske modifikacije 11. Transpozicijski elementi 12. Virusi	1. Mechanism of DNA replication 2. Mutations and DNA damage repair 3. Homologous recombination 4. Transcription and posttranscriptional processes 5. Genetic code and tRNA 6. Protein biosynthesis 7. Chromosome structure and genome organization 8. Regulation of expression in prokaryotes 9. Regulation of expression in eukaryotes 10. Protein targeting and posttranslational modifications 11. Transposition elements 12. Viruses

Laboratorijske vaje: 1. Plazmidi in transformacija bakterijskih celic 2. Laktozni operon in alfa komplementacija 3. Utišanje genov s protismerno RNA	Laboratory practicals: 1. Plasmids and transformation of bacterial cells 2. Lactose operon and alpha complementation 3. Gene silencing with antisense RNA

Temeljna literatura in viri / Readings:

- B.E. Tropp: Principles of Molecular Biology. Jones & Bartlett Learning, 2014

pomožni vir:

- J.E. Krebs, E.S. Goldstein, S.T. Kilpatrick: Lewin's Essential Genes, 3rd edition, Jones & Bartlett Learning, 2013

Cilji in kompetence:	**Objectives and Competences:**
Študenti bodo razumeli mehanizme prenosa genetske informacije in zorenja proteinov. Spoznali bodo raznolikost načinov delovanja molekul RNA in vedeli, kako je organiziran kromatin. S primeri bodo znali razložiti, kako sta povezani zgradba in funkcija proteinov.	Students will understand the mechanisms of genetic information flow and posttranslational processes. They will know the versatility of RNA molecules and the organisation of the chromatin. Based on examples, students will be able to demonstrate structure – function relationship in proteins.

Predvideni študijski rezultati:	**Intended Learning Outcomes:**
<u>Znanje in razumevanje</u> Znanje: Delovanje polimeraz in pomožnih proteinov pri ohranjanju in prenosu genetske informacije. Adapterska hipoteza in način povezovanja tRNA in aminokislin. Zgradba ribosomov in potek sinteze beljakovin. Zgradba genoma in načini uravnavanja izražanja genov. Lastnosti proteinov, ki določajo njihovo mesto v celici ali zunaj nje in mehanizmi usmerjanja proteinov. Mehanizmi znotrajcelične razgradnje beljakovin in njihova razgradnja v prebavilih. Zgradba virusov. Razumevanje: Različne vrste zapisa informacij v bioloških sistemih. Strukturna fleksibilnost nukleinskih kislin in pomen za uravnavanje prenosa genetske informacije. Mehanizmi zagotavljanja natančnosti prenosa zapisov z DNA na RNA in proteine. Pomen zorenja proteinov za njihovo delovanje in usmerjanje v celici. Pomen razgrajevanja proteinov za delovanje celice in za pridobivanje aminokislin	<u>Knowledge and Comprehension</u> Knowledge: Mechanisms of polymerases and accessory proteins in maintaining genetic information. Adapter hypothesis and mode of amino acid biding to tRNA. Ribosome structure and protein synthesis process. Genome organization and modes of regulating gene expression. Properties of proteins that determine their cellular localization and mechanisms of protein sorting. Mechanisms of intracellular protein degradation and protein digestion in the intestine. Viral structures. Comprehension: Various information formats in biological systems. Structural flexibility of nucleic acids and its role for regulation of genetic information flow. Mechanisms determining a faithful flow of information from DNA to RNA and proteins. Importance of protein maturation for its activity and cellular sorting. Importance of protein degradation for cell functions and acquiring amino acids for biosynthetic

za biosintezne reakcije. Interakcije med nukleinskimi kislinami in proteini v celicah in virusih.	reactions. Interactions between nucleic acids and proteins in cells and viruses.
Uporaba Sposobnost razlikovanja stopenj kompleksnosti organizmov (prokarionti, evkarionti) na osnovi poznavanja biokemijskih procesov. Delo z bakterijami in virusi: varnostni in praktični vidiki.	Application Differentiation between complexity levels of organisms (prokaryotes, eukaryotes) based on knowledge of biochemical processes. Practical considerations for work with bacteria and viruses.
Refleksija Do katere mere so prokarionti lahko modelni organizmi za biokemijske procese? Molekule prenašajo informacije v zaporedjih dušikovih baz na podoben način kot zaporedja bitov v računalništvu. Zaporedja nukleotidov so digitaliziran zapis življenja. Za evolucijo je potrebno ohranjanje, pa tudi spreminjanje genetske informacije. Protein ni funkcionalen brez nativne tridimenzionalne zgradbe. Okužba z virusi ni samo stvar izpostavljenosti virusom, pač pa je odvisna od površinskih struktur virusnega delca in celic, ki so za okužbo dovzetne.	Analysis In how far prokaryotes can serve as model organisms for biochemical processes? Molecules transfer information as sequences of nitrogen bases similarly to byte sequences in computers. Nucleotide sequences are digitalized life code. Evolution requires both maintaining and modifying genetic information. Proteins are not functional before they reach their native three dimensional structures. Viral infection is not only a matter of exposure; it crucially depends on surface structures on both viruses and susceptible cells.
Prenosljive spretnosti Pristopi k reševanju problemov v biokemiji (ob primerih klasičnih eksperimentov v molekularni biologiji). Interpretacija laboratorijskih testov, ki temeljijo na pretvorbi kromogenih substratov; kvantitativnost in kvalitativnost. Delo z DNA in bakterijami. Pripravljanje in predstavljanje strokovnih vsebin, napisanih v angleškem jeziku – uporaba terminološkega slovarja.	Skill-transference Ability Approaches to solving problems in biochemistry (gained from classical experiments in molecular biology). Interpretation of laboratory tests based on conversion of chromogenic substrates. Quantitative vs. qualitative tests. Working with DNA and bacteria. Preparing and presenting professional content based on English sources – use of the terminology dictionary.

Metode poučevanja in učenja:	**Learning and Teaching Methods:**
Predavanja, laboratorijske vaje, individualno in skupinsko delo pri pripravi seminarjev.	Lectures, laboratory practical courses, individual and group work for preparing seminars.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni izpit in seminarska naloga. Opravljene vaje so pogoj za pristop k izpitu.		Written examination, seminary presentation. Access to examination only with completed laboratory practicals.

Reference nosilca / Lecturer's references:

- LAH, Jurij, DROBNAK, Igor, **DOLINAR, Marko**, VESNAVER, Gorazd. What drives the binding of minor groove-directed ligands to DNA hairpins?. Nucleic acids research, ISSN 0305-1048, 2008, vol. 36, no. 3, str. 897-904. [COBISS.SI-ID 29269765]
- VASILJEVA, Olga, **DOLINAR, Marko**, TURK, Vito, TURK, Boris. Recombinant human cathepsin H lacking the mini chain is an endopeptidase. Biochemistry, ISSN 0006-2960. [Print ed.], 2003, vol. 42, str. 13522-13528. [COBISS.SI-ID 17899303]
- **DOLINAR, Marko**, MEHLE, Andreja, MOZETIČ-FRANCKY, Bojana, SCHWEIGER, Ana, TURK, Vito. Endoproteolytic pattern observed during refolding of a human exopeptidase proenzyme, procathepsin H, produced in Escherichia coli. Food technology and biotechnology, ISSN 1330-9862, 2000, vol. 38, str. 5-9. [COBISS.SI-ID 14910247]