

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	STRUKTURA PROTEINOV
<b>Course Title:</b>	PROTEIN STRUCTURE

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

**Vrsta predmeta / Course Type:** obvezni / Mandatory

**Univerzitetna koda predmeta / University Course Code:** BK135

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

<p><b>Vsebina:</b></p> <p>Osnovni gradniki in motivi strukture proteinov. Klasifikacija proteinskih struktur. Razredi proteinskih struktur s primeri (alfa, beta, alfa/beta proteini). Zvijanje in konformacijska fleksibilnost proteinov. Primeri povezave med strukturo in funkcijo proteinov: DNK-vezavni proteini, proteini v prenosu signalov, membranski proteini, fibrilarni proteini, proteini imuskega odziva. Strukturna podlaga encimske katalize. Metode za identifikacijo in analizo proteinov. Masna spektroskopija. Osnove proteomike in biologije sistemov. Metode za določanje tridimenzionalne strukture proteinov. Napovedovanje strukture proteinov. Proteinska bioinformatika. Evolucija</p>	<p><b>Content (Syllabus outline):</b></p> <p>Basic building blocks and motifs of protein structure. Classification of protein structures. Structural classes with examples (alpha, beta, alpha/beta proteins). Folding and conformational flexibility of proteins. Examples of structure-function relationships in proteins: DNA-binding proteins, proteins in signal transduction, membrane proteins, fibrillar proteins, proteins of the immune system. Structural basis of enzyme catalysis. Methods for the identification and analysis of proteins. Mass spectroscopy. Basics of proteomics and system biology. Methods for the determination of three-dimensional structures of proteins. Protein structure prediction. Protein</p>
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proteinov. Proteinski inženiring.

bioinformatics, Protein evolution. Protein engineering.

### Temeljna literatura in viri / Readings:

- Arthur M. Lesk: Introduction to Protein Science: Architecture, Function, and Genomics. 2nd ed. 2010. 430 str. (40%)
- Branden & Tooze: Introduction to Protein Structure. 2nd ed. 1999. 393 str. (40%)

### Cilji in kompetence:

Cilji: študenti spoznajo strukturno raznolikost proteinov in njihovo klasifikacijo, metode za analizo proteinov ter strukturno podlago interakcij proteinov z drugimi molekulami.

Kompetence: študenti se naučijo povezovati strukturo proteinov z njihovo biološko funkcijo.

### Objectives and Competences:

Objectives: students learn about with the structural diversity of proteins and their classification, methods used in protein analysis and the structural basis of protein interactions.

Competences: students learn to link the structure of proteins with their biological function.

### Predvideni študijski rezultati:

#### Znanje in razumevanje

Študenti pri predmetu pridobijo znanje o strukturi proteinov in njihovih interakcijah z drugimi molekulami, seznanijo se z najpogostejšimi raziskovalnimi metodami analize struktur proteinov in spoznajo pomembnost povezave med strukturo in funkcijo proteinov v bioloških sistemih.

#### Uporaba

Razumevanje strukture proteinov in njene povezave s njihovo funkcijo je ključnega pomena za razumevanje delovanja bioloških sistemov na molekularnem nivoju.

#### Refleksija

Študentje pridobijo način razmišljanja o funkciji proteinov z vidika njihove strukture.

#### Prenosljive spretnosti

Izkušnje pri reševanju problemov. Timsko delo (pri seminarskih in laboratorijskih vajah). Zbiranje in interpretiranje rezultatov ter njihovo kritično vrednotenje. Uporaba domače in tuje literature. Podajanje poročil o opravljenem delu.

### Intended Learning Outcomes:

#### Knowledge and Comprehension

Students gain knowledge of protein structure and the interactions of protein with other molecules, they become familiar with the most common research methods for protein structure analysis and learn the importance of the relationship between protein structure and function in biological systems.

#### Application

Understanding protein structure and its connection to protein function is critical for the understanding of biological systems at the molecular level.

#### Analysis

Students gain the ability to evaluate protein function from the structural perspective.

#### Skill-transference Ability

Problem-solving experience. Team work (seminar work and laboratory course). Collection, interpretation and critical assessment of results. Use of domestic and foreign literature. Writing laboratory reports.

### Metode poučevanja in učenja:

Predavanja, seminarji.  
Seminarske in laboratorijske vaje.

### Learning and Teaching Methods:

Lectures, seminars  
Seminar and laboratory tutorial.

**Načini ocenjevanja:****Weight (in %)****Assessment:**

Opravljene vaje so pogoj za pristop k izpitu.		Completed laboratory tutorial is a prerequisite for admission to the examination.
Seminarska naloga		Seminar work
Pisni izpit		Written examination

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

- **NOVINEC, Marko**, KORENČ, Matevž, CAFLISCH, Amedeo, RANGANATHAN, Rama, LENARČIČ, Brigita, BAICI, Antonio. A novel allosteric mechanism in the cysteine peptidase cathepsin K discovered by computational methods. Nature communications, ISSN 2041-1723, feb. 2014, vol. 5, art. no. 3287
- **NOVINEC, Marko**, KOVAČIČ, Lidija, LENARČIČ, Brigita, BAICI, Antonio. Conformational flexibility and allosteric regulation of cathepsin K. Biochemical journal, ISSN 0264-6021, 2010, vol. 429, no. 2, p. 379-389
- **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, str. 7893-78902