

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	ENCIMATIKA
<b>Course Title:</b>	ENZYMOLGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Biokemija, 1. stopnja	/	3.	5.
USP Biochemistry, 1 <sup>st</sup> Cycle	/	3 <sup>rd</sup>	5 <sup>th</sup>

**Vrsta predmeta / Course Type:**

obvezni / Mandatory

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

BK132

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:**

Nomenklatura in klasifikacija encimov: razredi encimov, reakcije, izoenzimi, ribocimi, abcimi. Encimska kataliza: teorija prehodnega stanja, različne oblike kataliz, eksperimentalni pristopi za določanje mehanizma reakcije, primeri. Osnove encimske kinetike: pridobivanje in obdelava kinetičnih podatkov, encimske enote, simboli, kinetika enosubstratnih in dvosubstratnih reakcij, kinetika predravnotežnega stanja. Regulacija encimske aktivnosti: inhibitorji, razpoložljivost substrata, ireverzibilne in reverzibilne kovalentne modifikacije, inhibicija s končnim produktom, kontrola aktivnosti

**Content (Syllabus outline):**

Nomenclature and classification of enzymes: classes of enzymes, types of reactions, isoenzymes, ribozymes, abzymes. Enzyme catalysis: transition state theory, different forms of catalysis, experimental approaches to the determination of enzyme mechanisms, examples. An introduction to enzyme kinetics: obtaining and analysing the kinetic data, enzyme units, symbols, kinetics of one-substrate and two-substrate reactions, pre-steady state kinetics. The control of enzyme activity: inhibitors, substrate availability, irreversible and reversible covalent modifications, end-product inhibition,

preko vezave liganda (alosterični in kooperativni efekt), primeri.  
 Encimi v organiziranih sistemih: klasifikacija multiencimskih sistemov, primeri.  
 Razgradnja proteinov: lizosomska in nelizosomska pot (ubikvitinacija, proteasom).

control of activity by ligand-induced conformational changes (allosteric and cooperative effects), examples.  
 Enzymes in organized systems: classification of multienzyme systems, examples.  
 Protein degradation: lysosomal and non-lysosomal pathways (ubiquitination, proteasome).

**Temeljna literatura in viri / Readings:**

- Fundamentals of Enzymology, Price N.C. & Stevens L., 3rd ed, Oxford University Press, 1999. 478 strani (60 %)

**Cilji in kompetence:**

Študentje spoznajo lastnosti in delovanje encimov. Na izbranih primerih se na strukturnem nivoju spoznajo z različnimi mehanizmi encimske katalize in tudi z različnimi strategijami kontrole njihove aktivnosti.

Študent bo sposoben samostojno izvesti encimske teste s pomočjo pripravljenih protokolov in kritično ovrednotiti rezultate.

**Objectives and Competences:**

**Objectives:**  
 Learning the functional properties of enzymes.  
 Familiarizing students with the structural basis of the mechanisms of enzyme catalysis and regulation in selected examples.

**Competences:**  
 Ability to independently perform enzyme reaction experiments according to prepared protocols and to critically evaluate the obtained results.

**Predvideni študijski rezultati:**

<u>Znanje in razumevanje</u> Pridobljeno znanje omogoča razumevanje encimsko kataliziranih reakcij in njihove regulacije na nivoju strukturno-funkcijskih lastnosti encimov.
<u>Uporaba</u> Poznavanje delovanja encimov ima široko uporabnost v vseh panogah, kjer so vključeni encimi (znanost, medicina, industrija).
<u>Refleksija</u> Študent poveže pridobljeno znanje s strategijami uporabnosti encimov.
<u>Prenosljive spretnosti</u> Sposobnost uporabe domače in tuje literature, kritično branje raziskovalnih člankov, sposobnost ustnega in pisnega poročanja.

**Intended Learning Outcomes:**

<u>Knowledge and Comprehension</u> Acquired knowledge enables the understanding of enzyme-catalysed reactions and their regulation at the structural and functional levels.
<u>Application</u> Knowledge of enzyme function is widely applicable in various fields, such as research, medicine and industry.
<u>Analysis</u> Students are able to link the acquired knowledge with the strategies of the use of enzymes.
<u>Skill-transference Ability</u> Ability to use Slovenian and foreign literature, critical reading of scientific papers, ability of oral and written reporting.

**Metode poučevanja in učenja:**

**Learning and Teaching Methods:**

Predavanja, raziskovalni seminar,  
laboratorijske vaje

Lectures, research seminar, laboratory courses

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %) **Assessment:**

Opravljene vaje so pogoj za pristop k izpitu. Seminarska naloga Pisni izpit Ocene: 6-10 (pozitivno), 1-5 (negativno)		Completed laboratory course is prerequisite for the exam. Seminar work Written exam Grades: 6-10 (positive), 1-5 (negative)
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**Reference nosilca / Lecturer's references:**

- ULČAKAR, Liza, **NOVINEC, Marko**. Inhibition of human cathepsins B and L by caffeic acid and its derivatives. *Biomolecules*. Jan. 2021, vol. 11, iss. 1, str. 1-9.
- GORIČAN, Tjaša, CIBER, Luka, PETEK, Nejc, SVETE, Jurij, **NOVINEC, Marko**. Synthesis and kinetic characterization of hyperbolic inhibitors of human cathepsins K and S based on a succinimide scaffold. *Bioorganic chemistry*. Oct. 2021, vol. 115, str. 1-13.
- REBERNIK, Mateja, SNOJ, Tina, KLEMENČIČ, Marina, **NOVINEC, Marko**. Interplay between tetrameric structure, enzymatic activity and allosteric regulation of human dipeptidyl-peptidase I. *Archives of biochemistry and biophysics*. 30 Oct. 2019, vol. 675, str. 1-11.