

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	UPORABA ENCIMOV
Course Title:	APPLIED ENZYMOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Biokemija, 1. stopnja	/	3.	6.
USP Biochemistry, 1 st Cycle	/	3 rd	6 th

Vrsta predmeta / Course Type:

izbirni strokovni / Elective Professional

Univerzitetna koda predmeta / University Course Code:

BKSI4

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:

prof. dr. Brigita Lenarčič / Dr. Brigita Lenarčič, Full 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:

Varnostni in regulatorni aspekti encimske uporabe, dokumentacija.
 Intelektualna zaščita: objave in patenti.
 Pridobivanje encimov v industrijske namene: iskanje virov, priprava biološkega materiala, mediji za produkcijo encimov, optimizacija proizvodnje.
 Metode pri pripravi tehničnih encimskih preparatov v industrijskem merilu: homogenizacija, centrifugiranje, filtriranje, dvofazni sistemi, kromatografije.
 Imobilizirani encimi: ekonomski vidiki, uporabnosti, načini priprave, primeri.
 Encimi na trgu: encimi v prehrani (procesiranje škroba pri predelavi sadja in zelenjave, pri proizvodnji piva in vina, vloga encimov v

Content (Syllabus outline):

Safety and regulatory aspects of enzyme use, documentation.
 Intellectual property: publishing and patenting.
 Industrial enzyme preparations: screening sources, preparation of biological material, production optimization.
 Large-scale preparation of technical enzymes, methods (homogenisation, centrifugation, filtration, biphasic systems, cell breakage, chromatographies).
 Immobilized enzymes: economic aspects, coupling methods, examples.
 Enzymes on the market: food industry (starch processing, vegetable and fruit processing, brewing industry, juice- and winemaking, enzymes for dairy products and animal feed)

mlečnih izdelkih, živalski krmi), encimi v detergentih, pri strojenju kože, v tekstilni industriji, pri proizvodnji papirja, pri analizi prehrane in pri genskem inženiringu. Biosenzorji.
Vloga encimov pri remediaciji onesnaženega okolja.
Uporaba encimov v kliniki: določanje encimske aktivnosti v klinične namene, primeri encimov v povezavi z boleznimi.

laundry detergents, tanning industry, textile industry, paper industry, food analysis, genetic engineering.
Biosensors.
Role of enzymes in the remediation of polluted environments.
Clinical use of enzymes: determination of enzyme activities for clinical diagnosis, examples of enzymes in different diseases.

Temeljna literatura in viri / Readings:

- Enzymes in Industry: Production and Application, W. Aehle, 3rd ed. WILEY-VCH, 2007, strani 485 (50%)

Cilji in kompetence:

Cilj predmeta je, da se študentu poda obširen pregled uporabnosti biokatalizatorjev (encimov) v tehnične namene. Študent zna kompetentno oceniti ustreznost uporabe encimov in s tega vidika ovrednotiti prednost uporabe encima v tehnološkem postopku pri pripravi ali predelavi določenega produkta.

Objectives and Competences:

The objective of the course is to provide the students with novel overview of the use of biocatalysts (enzymes) for technical purposes. Students obtain **the competence** to evaluate the potential advantages of the use of enzymes in technological procedures used for the production of specific products.

Predvideni študijski rezultati:

Znanje in razumevanje
Poznavanje in razumevanje uporabnosti številnih encimov v različnih tehnologijah priprave ali predelave določenih produktov.

Uporaba
Pridobljeno znanje bo študent lahko uporabil na različnih področjih: prehrabna in tekstilna industrija, medicina, klinične preiskave...

Refleksija
Študent bo razvil znanje potrebno za načrtovanje dela pri pripravi produktov s pomočjo encimov.

Prenosljive spretnosti
Spretnost uporabe literature in drugih virov, zbiranje podatkov in njihova interpretacija ter sposobnost ustnega in pisnega poročanja.

Intended Learning Outcomes:

Knowledge and Comprehension
Knowledge and comprehension of the use of various enzymes for technological purposes.

Application
The obtained knowledge is applicable in different fields: food and textile industry, medicine, clinical application...

Analysis
Students will develop the knowledge necessary for planning the procedures involving the use of enzymes for technological purposes.

Skill-transference Ability
Use of literature, data collection and interpretation, oral and written reporting.

Metode poučevanja in učenja:

Predavanja, seminar/projekt in laboratorijske vaje.

Learning and Teaching Methods:

Lectures, seminar/project and laboratory courses.

Deež (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:

- Oppert, B., Morgan, TD, Hartzler, K., **Lenarčič, B.**, Galeša, K., Brzin, J., Turk, V., Yoza, K., Ohtsubo, K. & Kramer, KJ. Effects of proteinase inhibitors on digestive proteinases and growth of the red flour beetle, *Tribolium castaneum* (Herbst) Coleoptera: Tenebrionidae. *Comp Biochem Physiol, Toxicol Pharmacol*, 134, 481-490, 2003.
- **Lenarčič, B.**, & Turk, V. Thyroglobulin type-1 domains in equistatin inhibit both papain-like cysteine proteinases and cathepsin D, *J Biol Chem*, 274, 563-566, 1999.
- Gruden, K., Štrukelj, B., Popovič, T., **Lenarčič, B.**, Bevec, T., Brzin, J., Kregar, I., Herzog-Velikonja, J., Stiekema, W.J., Bosch, D. & Jongsma, M.A. The cysteine protease activity of Colorado potato beetle (*Leptinotarsa decemlineata* Say) guts, which is insensitive to potato protease inhibitors, is inhibited by thyroglobulin type-1 domain inhibitors, *Insect. Biochem Mol Biol*, 28, 549-560, 1998.