UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Proteinski toksini - karakterizacija in uporaba v celični biologiji
Course title:	Protein Toxins -Characterisations and Applications in Cellular Biology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Nanoznanosti in nanotehnologije, 3. stopnja Nanosciences and Nanotechnologies, 3rd cycle	Bioznanosti Biosciences	1	1

Vrsta predmeta / Course type Izbirni / Elective

Univerzitetna koda predmeta / University course code: NANO3-824

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	**30**			**30**	**210**	**10**

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transfered to individual work.*

Nosilec predmeta / Lecturer: Prof. dr. Igor Križaj

Jeziki / Languages:	**Predavanja / Lectures:**	slovenščina, angleščina / Slovenian, English
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Zaključena druga stopnja bolonjskega študija ali diploma univerzitetnega študijskega programa. Potrebna so tudi osnovna znanja s področja biokemije in molekularne biologije.	Completed Bologna second level study program or an equivalent pre-Bologna university study program. Basic knowledge of biochemistry and molecular biology is also requested.

Vsebina:	Content (Syllabus outline):
• Pregled najpomembnejših virov proteinskih toksinov, • proteomska karakterizacija strupov –venomika in antivenomika, pregled sodobnih eksperimentalnih metod in tehnik za čiščenje proteinskih toksinov, • pregled sodobnih eksperimentalnih metod in tehnik za karakterizacijo proteinskih toksinov, njihovih fizikalno-kemijskih lastnosti, strukture in biokemijskih lastnosti, • pregled sodobnih eksperimentalnih metod in	• Survey of the most important sources of protein toxins, • proteomic characterization of venoms – venomics and antivenomics, • survey of recent experimental methods and techniques for purification of protein toxins, • survey of recent experimental methods and techniques for characterization of protein toxins, their physico-chemical characteristics, structure and biochemical features, • survey of recent experimental methods and

tehnik za karakterizacijo pato-fiziološkega delovanja najpomembnejši skupin proteinskih toksinov; uporaba celičnih kultur, • molekularni mehanizmi delovanja izbranih proteinskih toksinov, • uporaba proteinskih toksinov v raziskovalne namene, • uporaba proteinskih toksinov v terapevtske namene.	techniques for characterization of patho-physiological characteristics of the main protein toxin groups; the use of cell cultures, • molecular mechanisms of action of selected protein toxins, • use of protein toxins in research, • use of protein toxins in therapeutic applications.

Temeljni literatura in viri / Readings:

1. Zapiski predavanj / Lecture notes
2. Izbrani pregledni članki npr. / Selected review papers *e.g.*
   - Harvey, A.L. (2014): Toxins and drug discovery (Review). *Toxicon* 92: 193–200.
   - Šribar, J., Oberčkal, J. and Križaj, I. (2014): Understanding the molecular mechanism underlying the presynaptic toxicity of secreted phospholipases A2 – an update. (Review). *Toxicon* 89, 9–16.
   - Rossetto, O., Pirazzini, M. and Montecucco, C. (2014): Botulinum neurotoxins: genetic, structural and mechanistic insights. (Review). *Nat. Rev. Microbiol.* 12: 535–549.
   - Calvete, J.J. (2013): Snake venomics: From the inventory of toxins to biology. (Review). *Toxicon* 75, 44–62.
   - McCleary, R.J.R. and Kini, M.R. (2013): Non-enzymatic proteins from snake venoms: A gold mine of pharmacological tools and drug leads. (Review). *Toxicon* 62, 56–74.
   - Casewell, N.R., Wüster, W., Vonk, F.J., Harrison, R.A. and Fry, B.G. (2013): Complex cocktails: the evolutionary novelty of venoms. (Review). *Trends Ecol. Evol.* 28, 219–229.
   - Sajevic, T., Leonardi, A. and Križaj, I. (2011): Haemostatically active proteins in snake venoms. (Review). *Toxicon* 57, 627–645.
3. Izbrani zborniki in knjige npr. / Selected collections and books *e.g.*
   - Stöcklin, R. and Harvey, A.L. (eds.) 2012: From venoms to drugs. Toxicon 59 (4) Elsevier Ltd.
   - Kini, M.R., Clemetson, K.

Cilji in kompetence:	**Objectives and competences:**
Seznaniti študente s: • sodobnimi eksperimentalnimi metodami in tehnikami za čiščenje proteinskih toksinov, • sodobnimi eksperimentalnimi metodami in tehnikami za biokemijsko in pato-fiziološko karakterizacijo proteinskih toksinov, • primeri uporabe proteinskih toksinov kot orodij v raziskovalne namene, • primeri uporabe proteinskih toksinov v terapevtske namene. <u>Splošne kompetence:</u> • Študent bo spoznal raziskovalne metode in postopke za izolacijo in karakterizacijo proteinskih toksinov, • razvil bo sposobnost samokritične presoje svojih raziskovalnih aktivnosti,	To inform the students about: • recent experimental methods and techniques for purification of protein toxins, • recent experimental methods and techniques for biochemical and patho-physiological characterization of protein toxins, • selected examples of application of protein toxins as research tools, • selected examples of the use of protein toxins in medical applications. <u>General Competences:</u> • The student will learn about the methods and procedures to isolate protein toxins and to characterize them, • will develop the skill to critically asses his research activities,

• pridobil bo sposobnost uporabe znanja v praksi, • razvil bo sposobnosti posredovanja rezultatov raziskovalnega dela širši javnosti, s posebnim poudarkom na komunikaciji v mednarodnem okolju, • naučil se bo kooperativnosti, dela v skupini (in v mednarodnem okolju). Predmetnospecifične kompetence: Študent bo znal poiskati ustrezen proteinski toksin in ga uporabiti kot pripomoček pri svojem raziskovalnem delu.	• will develop the skill to transfer ideas from the basic knowledge pool into applications, • will develop the skill to communicate scientific results to broader community with particular emphasis on communication in the international environment, • will learn to work in a team (and in international environment). Course Specific Competences: The student will learn to pick an appropriate protein toxin to use it as a tool in his scientific work.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent bo spoznal glavne skupine proteinskih toksinov, metodologije za njihovo čiščenje in karakterizacijo njihovih lastnosti, načine njihovega delovanja in glavna področja njihove uporabe.	Student will learn about the main groups of protein toxins, about methodologies for their purification and characterisation, about mechanisms of their action, and about the main areas of their utilisation.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja. • Seminarji. • Konzultacije. • Individualno laboratorijsko delo.	• Lectures. • Seminars. • Consultations. • Individual laboratory work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• seminar	50 %	• seminar
• ustni izpit	50 %	• oral exam

Reference nosilca / Lecturer's references:

1. Oberčkal, J., Kovačič, L., Šribar, J, Leonardi, A., Dolinar, K., Pucer Janež A. and Križaj, I. (2015): On the role of protein disulphide isomerase in the retrograde cell transport of secreted phospholipases A2. PLoS One 10(3), e0120692.
2. Leonardi, A., Sajevic, T., Kovačič, L., Pungerčar, J., Lang Balija, M., Halassy, B., Trampuš-Bakija, A. and Križaj, I. (2014): Hemorrhagin VaH4, a covalent heterodimeric P-III metalloproteinase from Vipera ammodytes ammodytes with potential anti-tumour activity. Toxicon 77, 141–155.
3. Sajevic, T., Leonardi, A., Kovačič, L., Lang Balija, M., Halassy, B., Pungerčar, J., Trampuš-Bakija, A. and Križaj, I. (2013): VaH3, one of the principal hemorrhage-inducing factors in Vipera ammodytes ammodytes venom, is a homodimeric P-IIIc metalloproteinase. Biochimie 95, 1158–1170.
4. Leonardi, A., Biass, D., Kordiš, D., Stöcklin, R., Favreau, P. and Križaj, I. (2012): Conus consors snail venom proteomics unveils functions, pathways and novel families involved in its venomic system. J. Proteome Res. 11, 5046–5058.
5. Mattiazzi, M., Sun, Y., Wolinski, H., Bavdek, A., Petan, T., Anderluh, G., Kohlwein, S.D., Drubin, D., Križaj, I. and Petrovič, U. (2012): A neurotoxic phospholipase A2 impairs yeast amphiphysin activity and reduces endocytosis. PLoS One 7(7), e40931.