



UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Interakcije nanomaterialov in bioloških sistemov
Subject Title:	Interactions between nanomaterials and biological systems

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
FIZIKA PHYSICS		1 ali 2	1 ali 2

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30	20				250	10

Nosilec predmeta / Lecturer:

Jeziki / Languages:	Predavanja / Lecture:	slovenski/Slovenian in/and angleški s slovenskim prevodom/English with translation in Slovenian
	Vaje / Tutorial:	<input type="text"/>

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Ni posebnih zahtev.

Prerequisites:

No special prerequisites.

Vsebina:

- Zlivanje lipidnih vesiklov in biomembran
- Prenos lipofilnih substanc s trdnimi lipidnimi nanodelci
- Antibakterijska zaščita opreme z nanomateriali
- Interakcija guanizinskih kompleksov s celicami
- Molekularni označevalci nanodelcev
- Detekcija toksinov s pomočjo biosenzorjev na membranah
- Preprečevanje razvoja biofilmov na tehnološko pomembnih površinah
- Interakcija toksinov s celičnimi membranami
- Prilagodljivost virusnih plaščnih proteinov na različna lipidna okolja
- Interakcija in dinamika v dendrimernih sistemih za transport učinkovin

Content (Syllabus outline):

- Liposome-Cell Membrane fusion
- Lipophilic substances transport with solid lipid nanoparticles
- Antibacterial protection with nanomaterials
- Guanisin complex - cell interaction
- Nanoparticle Molecular Labels
- Toxin detection via membrane biosensors
- Preventing biofilm growth on technologically important surfaces
- Toxin-cell membrane interaction
- Adaptation of viral coat proteins in various lipid environments
- Interactions and dynamics in dendrimer systems for drug delivery

Temeljni literatura in viri / Textbook:

1. J. Israelaschvili: Intermolecular Interactions & Surface Forces. Academic Press, London, 1992.
2. C. M. Niemeyer and C. A. Mirkin: Nanobiotechnology: Concepts, Applications and Perspectives, Wiley-VCH, 2004
3. Izbrani članki: S. Martens, H. T. McMahon: Mechanisms of membrane fusion: disparate players and common principles. Nature Reviews Molecular Cell Biology 9, 543-556, 2008; S. A. Wissinga, O. Kayserb and R. H. Müller: Solid lipid nanoparticles for parenteral drug delivery. Advanced Drug Delivery Reviews 56, 1257-1272, 2004; I. Yacoby, I. Benhar. Antibacterial nanomedicine. Nanomedicine 3, 329-341, 2008; H.Ti Tien. Bilayer lipid membrane-based electrochemical biosensors. Journal of Clinical Laboratory Analysis 2, 256 – 264, 2005.

Cilji:

Objectives:

Študenti poglobijo znanje s področja molekularnih znanosti ter nanomaterialov s posebnim poudarkom na interakcijah nanomaterialov z biološkimi sistemi, kar predstavlja enega najbolj vročih problemov nanobiotehnologije. Razumejo pomembnost povezanosti področij naravoslovja in tehnike ter način razmišljanja pri reševanju struktur in funkcij kompleksnih bioloških sistemov. Poznajo najnovejše raziskave in delo raziskovalnih skupin na tem področju v regiji.

Students acquire advanced knowledge on fields of molecular sciences and nanomaterials with special focus on the interactions between nanomaterials and biological systems, that represents one of the hot topics current nanobiotechnology. Students understand an importance of the connections between the natural sciences and technology as well as the way of thinking while resolving structure and function of complex biological systems. Students get familiar with up-to-date research work and research teams working in that field in the region.

Predvideni študijski rezultati:

Znanja in razumevanja:
Poglabljanje znanja o interakcijah med nanomateriali in biološkimi sistemi, kar je osnova za varno aplikativno raziskovalno in razvojno delo ter produkte na tem področju.

Prenosljive/ključne spretnosti in drugi atributi:

- sposobnost reševanja tehnoloških in biokompatibilnostnih problemov na področju novih materialov in tehnologij s fizikalnimi pristopi na bioloških sistemih
- sposobnost oblikovanja in implementacije izvirnih znanstvenih rešitev v danih biofizikalnih, nanotehnoloških in interdisciplinarnih problemih.

Intended learning outcomes:

Knowledge and Understanding:
Gaining additional knowledge about interactions between nanomaterials and biosystems, which is basis for safe applied research & development work and products in this field.

Transferable/Key Skills and other attributes:

- ability of solving of technological and biocompatibility problems in the field of novel materials and technologies with physical approaches on biosystems.
- ability of defining and implementing unique scientific solution within defined biophysical, nanotechnological and interdisciplinary problems.

Metode poučevanja in učenja:

Predavanja, seminar in izdelava seminarske naloge iz področja interakcij nanomaterialov in bioloških sistemov.

Learning and teaching methods:

Lectures, seminar and work out of seminar from the field of interacting nanomaterials and biological systems.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Seminarska naloga	50	Course work
Ustni izpit	50	Oral exam