



UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Nanobionika
Subject Title:	Nanobionics

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:	Angleški s slovenskim prevodom / English with translation in Slovenian
	Vaje / Tutorial:	

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

Ni posebnih zahtev.

Prerequisites:

No special prerequisites.

Vsebina:

- Biopolimeri kot gradniki v nanotehnologiji
- Stikala, pomnilnik in računanje s plavajočo vejico na osnovi DNA in drugih biomolekul
- Razpoznavna na osnovi lateralno heterogenih podprtih membrane
- Neuronske mreže kot mikroelektronske naprave
- Inžiniring na osnovi fotopolimerov
- Magnetosomi: nanometriški magnetni materiali na osnovi železa v bakterijah
- Sinteza insulina oz. encimov na površinah
- Kostni – primer samoobnovljivega biomateriala

Content (Syllabus outline):

- Biopolymers as building blocks in nanotechnology
- Switches, memory and floating-operation based calculation on DNA and other biomolecules
- Recognition based on laterally heterogeneous supported membranes
- Neural networks as microelectronic devices
- Photopolymers-based engineering
- Magnetosomes: Nanoscale Magnetic Iron Minerals in Bacteria
- Insulin/Enzymes synthesis on surfaces
- Bones – an example of self-renewable biomaterials

Temeljni literatura in viri / Textbook:

1. Martyn Amos: Theoretical and Experimental DNA Computation, Springer, 2005
2. C. M. Niemeyer and C. A. Mirkin: Nanobiotechnology: Concepts, Applications and Perspectives, Wiley-VCH, 2004
3. C.A. Mirkin, C.M. Niemeyer: Nanobiotechnology II: More Concepts and Applications, Wiley-VCH, 2004

Cilji:

Študenti poglobijo znanje s področja aplikativne nanobiofizike na primerih prenosa v naravi izraženih in delujočih procesov v umetno okolje za namene nanotehnologije – torej izrazito miniaturiziranih tehnoloških procesov. Razumejo pomembnost povezanosti področij naravoslovja in tehnike ter način razmišljanja pri doseganju funkcionalnosti nanometriških kompleksnih sistemov, ki posnemajo naravne biološke sisteme. Poznajo najnovejše raziskave in delo raziskovalnih skupin na tem področju v regiji.

Objectives:

Students acquire advanced knowledge in the field of applicative nanobiophysics on the examples of transfer of natural processes into artificial environment to achieve goals of nanotechnology, i.e. miniaturization of technological processes. Student understand the importance of the connections between the fields from natural sciences and technology as well as the way of thinking while achieving the functionality of nanoscale complex systems that mimic natural biosystems. 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:
 Poglobljanje znanja o interakcijah med komponentami v bioloških sistemih ter o naravnih procesih, ki se jih da uporabiti v nanotehnologijah, iz česar se lahko potencialno razvijajo nove nanobiotehnologije.

Prenosljive/ključne spretnosti in drugi atributi:
 - sposobnost reševanja tehnoloških in biokompatibilnostnih problemov na področju novih (nano)materialov in (nano-,nanobio-, bio-)tehnologij s fizikalnimi, tehničnimi in bioničnimi 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 (nano)materials and (nano-, nanobio-, bio-)technologies with physical, technical and bionical 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 nanobionike.

Learning and teaching methods:

Lectures, seminar and work out of seminar from the field of nanobionics.

Načini ocenjevanja:

Delež (v %) /
 Weight (in %)

Assessment:

Seminarska naloga	50	Course work
Ustni izpit	50	Oral exam