



UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Izbrane vsebine in novosti v biofiziki in medicinski fiziki
Subject Title:	Selected topics and novelties in biophysics and medical physics

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Splošna medicina General Medicine - EMŠP		1	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
5	40				45	3

Nosilec predmeta / Lecturer:

Jeziki / Languages:

Predavanja / Lecture:

Vaje / Tutorial:

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

Prerequisites:

Vsebina:

Transport snovi preko celične membrane, osmoza, ionski prenašalci in črpalke. Kalcijeva signalizacija v celičnih procesih. Prenos signala med celicami. Biofizikalni mehanizmi krčenja mišice in kontraktilnih proteinov. Molekularni motorji. Biomehanika kosti in mišic. Biofizika dihalnega sistema. Biofizika srčnožilnega sistema. Biofizika prenosa živčnega signala. Biofizika vida. Biofizika sluha. Biofizikalni vidiki ionizirajočega sevanja. Napredne eksperimentalne metode v biofiziki in medicinski fiziki.

Content (Syllabus outline):

Cell membrane transport, osmosis, ionic carriers and pumps. Calcium signalization in cell processes. Signal transmission between cells. Biophysical mechanisms of contraction of muscles and contractile proteins. Molecular motors. Biomechanics of bones and muscles. Biophysics of respiratory system. Biophysics of cardiovascular system. Biophysics of transmission of a nerve signal. Vision biophysics. Biophysics of hearing. Biophysical aspects of ionizing radiation. Advanced experimental methods in biophysics and medical physics.

Temeljni literatura in viri / Textbooks:

- George B. Benedek, Felix M.H. Villars: Physics with Illustrative Examples from Medicine and Biology: 1. Mechanics, 2. Statistical Physics, 3. Electricity and Magnetism; Springer Verlag, New York 2000.
- Russell K. Hobbie: Intermediate Physics for Medicine and Biology; John Wiley & Sons, New York 1997.
- Jack A. Tuszynski, Michal Kurzynski: Introduction to Molecular Biophysics, CRC Press, Boca Raton 2003.
- Roland Glaser: Biophysics; Springer Verlag, Berlin 2001.
- Milan Brumen: Ravnovesna porazdelitev vode in ionov prek celične membrane. *Med. razgl.*, 25 (1986) 167-177.
- Gleb B. Sukhorukov and Helmuth Möhwald: Multifunctional cargo systems for biotechnology. *Trends in Biotechnology*, 25 (2006) 93-98.

Cilji:

Na osnovi fizikalnih konceptov in zakonitosti ter biofizikalnih mehanizmov osvojiti razumevanje fizioloških procesov v človeškem organizmu ter bioloških procesov na ravneh tkiva, celice ter supramolekularnih in makromolekularnih struktur. Razumeti fizikalne osnove naprednih diagnostičnih in terapevtskih metod medicinske fizike.

Objectives:

To comprehend human physiological processes as well as biological processes running on different levels of biological organisation such as tissues, cells, and supramolecular and macromolecular structures, from the point of view of physical concepts and laws and biophysical mechanisms. To comprehend basic physics of advanced diagnostic methods and therapeutic methods of medical physics.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študentje osvojijo razumevanje različnih procesov v biologiji in fiziologiji na osnovi fizikalnih konceptov in zakonov ter biofizikalnih mehanizmov in modelov.

Prenesljive/ključne spretnosti in drugi atributi:

Študentje znajo uporabiti biofizikalne modele za obravnavo strukture in funkcije izbranih bioloških sistemov in primerov iz humane fiziologije. Študentje razširijo razgledanost na področju naravoslovja.

Intended learning outcomes:

Knowledge and Understanding:

Students get understanding of various processes in biology and physiology based on concepts and laws in physics as well as on biophysical mechanisms and models.

Transferable/Key Skills and other attributes:

Students are able to use biophysical models for discussing structure and function of selected biological systems and cases in human physiology. They become well broadly versed in science.

Metode poučevanja in učenja:

Predavanja.
Seminar.

Learning and teaching methods:

Lectures.
Course work.

Načini ocenjevanja:

Seminar

Delež (v %) /
weight (in %)

Assessment:

seminar

100