



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Fizika</b>
<b>Course title:</b>	<b>Physics</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program Biologija, 1. stopnja		1.	1.
Undergraduate university programme Biology, 1st degree		1st	1st

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30			30		120	6

Nosilec predmeta / Lecturer:

Jeziki / Languages: **Predavanja / Lectures:**   
**Vaje / Tutorial:**

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

**Vsebina:**

Elektromagnetno valovanje: spektri, izvori, lastnosti, absorpcija, sevanje, eksperimentalne metode, ki temeljijo na odboju / absorpciji / emisiji / fluorescenci / sipanju EM valovanja, Beer-Lambertov zakon

Termodinamika: pretok snovi (difuzija, osmoza) in toplote oz. energije (prevajanje, konvekcija, sevanje), energijski tok metabolizma, regulacija temperature v človeškem telesu.

Mehanika: statika in dinamika točkastih in togih teles; kinematski in dinamski pristop k obravnavi gibanja točkastih teles v 1D; vrtenje; sila, tlak, navor (vzvodi v človeškem telesu), delo, energija, moč; energijski zakon; deformacije (kosti); hidrostatika in hidrodinamika; aplikacije Bernoullijeve enačbe, viskoznost, Hagen - Poiseuilleov zakon, Reynoldsovo število; laminarni in turbulentni tokovi.

Nihanje: harmonske oscilacije (HO), dušene oscilacije, periodično vzbujanje v HO, oscilacije v bioloških in kemijskih sistemih, samovzdrževane oscilacije, stabilnost

Zvok: lastnosti zvočnega valovanja, spektri, interval slišnosti, občutljivost ušesa, intenziteta, analiza zvoka, ultrazvočno slikanje

Moderna fizika: zgradba in model atoma, aplikacije radioaktivnosti in ionizirajočega sevanja, varnost pred sevanji

Električno in magnetno polje: Električna sila, polje, potencial (aplikacije v biologiji in medicini) magnetna sila in polje, gibanje nabitih delcev v E in M polju, katodna cev, rentgenska cev, masni spektrometer

Študent opravi 10 laboratorijskih vaj s področij mehanike, termodinamike, električnih in magnetnih pojavov, valovne

**Content (Syllabus outline):**

Electromagnetic waves: EM spectrum, sources, properties, absorption, emission; experimental methods based on the detection of reflected/emitted/absorbed/scattered/fluoresced EM waves, Beer-Lambert's law

Thermodynamics: flow of matter (diffusion, osmosis) and heat/energy (conduction, convection, radiation); metabolic energy flow, regulation of body temperature  
Mechanics: statics and dynamics of particles and rigid bodies; kinematic and dynamic approach to the study of motion in 1D; rotation; force; pressure; torque (levers in the human body), work, energy, power, conservation of energy, deformations (in bones); hydrostatics, hydrodynamics, applications of Bernoulli's equation, Hagen – Poiseuille's law, Reynolds's number; laminar turbulent flow

Oscillations: harmonic oscillations (HO), damped HO, periodically forced HO, oscillations in biological and chemical systems, self-sustained oscillations, stability

Sound: properties, spectra, interval of hearing, sensitivity of human ear, intensity, analysis of the sound, ultrasound imaging

Modern physics: structure and model of the atom, applicability of radioactivity and ionizing radiation, safety

Electric and magnetic (EM) field: electric - force, field, potential (applications in biology and medicine), magnetic - field, force; motion of charged particles in EM fields, cathode ray tube, roentgen apparatus and imaging, mass spectrometer

Students carries out 10 laboratory exercises from the fields of mechanics, thermodynamics, electric and magnetic

in geometrijske optike, moderne fizike in radioaktivnosti. Vsebina vaj je aplicirana na biološke sisteme.

phenomena, wave and geometric optics, modern physics and radioactivity. Lab work is applied to the study of biological systems.

### Temeljni literatura in viri / Readings:

1. Jay Newman (2000) Physics of the Life Sciences, Springer, New York
2. Douglas C. Giancoli (1998) Physics principles with applications (5<sup>th</sup> ed. ali višja), Prentice Hall, Englewood Cliffs
3. Klemen Bohinc (2014) Fizika človeškega telesa, Zdravstvena fakulteta Univerze v Ljubljani, Ljubljana
4. Interna skripta in navodila za laboratorijske vaje, izročki prosojnic s predavanj in druga dodatna interna študijska literatura, ki je v elektronski obliki dostopna na: <http://estudij.fnm.uni-mb.si/> oz. na: <https://estudij.um.si/> v okviru predmeta Fizika.

### Cilji in kompetence:

Usvojiti osnovne fizikalne koncepte in zakonitosti, pomembne za razumevanje procesov v živi in neživi naravi

### Objectives and competences:

The main objective is to gain the knowledge of fundamental physical concepts and laws which are essential for understanding the processes in nature.

### Predvideni študijski rezultati:

#### Znanje in razumevanje:

Študent razume osnovne fizikalne procese v naravi

#### Prenosljive/ključne spretnosti in drugi atributi:

Študent zna kvalitativno in kvantitativno opisati nekatere osnovne fizikalne pojave v naravi in jih analizirati s preprostimi matematičnimi metodami in modeli.

### Intended learning outcomes:

#### Knowledge and understanding:

Students get understanding of fundamental physical processes in nature

#### Transferable/Key Skills and other attributes:

Students are able to describe basic physical processes in nature, qualitatively and quantitatively, and to analyze them with fundamental mathematical methods and models

### Metode poučevanja in učenja:

Predavanja  
Laboratorijske vaje (v celoti opravljene laboratorijske vaje so pogoj za pristop k nadaljnjim preizkusom znanja)

### Learning and teaching methods:

Lectures  
Laboratory work (completed laboratory work is obligatory for the admittance to examination)

### Načini ocenjevanja:

Delež (v %) /  
Weight (in %)      **Assessment:**

Pisni kolokvij iz laboratorijskih vaj (pozitiven kolokvij iz laboratorijskih vaj (rezultat mora biti višji ali enak 50 %) je pogoj za pristop k pisnemu in ustnemu izpitu)

30

Written test within laboratory work (positive test (result should be larger or equal to 50 %) is a precondition for the admittance to written and oral examination)

Pisni izpit (pisni izpit je možno opraviti z dvema pisnima kolokvijema, pri čemer mora biti skupni rezultat višji ali enak 50%, posamezni kolokvij pa ne sme biti nižji od 30%)	50	Written exam (written test might be accomplished by two written tests, whereby the overall results should be equal or larger than 50 % and a single test should not be lower than 30 %)
Ustni izpit	20	Oral exam

**Reference nosilca / Lecturer's references:**

- DOBOVIŠEK, Andrej, FAJMUT, Aleš, BRUMEN, Milan. Strategy for NSAID administration to aspirin-intolerant asthmatics in combination with PGE [sub] 2 analogue: a theoretical approach. Medical & biological engineering & computing, ISSN 0140-0118. [Print ed.], 2012, vol. 50, no. 1, str. 33-42, doi: 10.1007/s11517-011-0844-x. [COBISS.SI-ID 18845192]
- MBIKOU, Prisca, FAJMUT, Aleš, BRUMEN, Milan, ROUX, Etienne. Contribution of Rho kinase to the early phase of the calcium-contraction coupling in airway smooth muscle. Experimental physiology, ISSN 0958-0670, 2011, vol. 96, issue 2, str. 240-258, ilustr., doi: 10.1113/expphysiol.2010.054635. [COBISS.SI-ID 18009864]
- DOBOVIŠEK, Andrej, FAJMUT, Aleš, BRUMEN, Milan. Role of expression of prostaglandin synthases 1 and 2 and leukotriene C [sub] 4 synthase in aspirin-intolerant asthma: a theoretical study. Journal of pharmacokinetics and pharmacodynamics, ISSN 1567-567X, 2011, vol. 38, no. 2, str. 261-278, doi: 10.1007/s10928-011-9192-6. [COBISS.SI-ID 18203144]
- FAJMUT, Aleš, BRUMEN, Milan. MLC-kinase/phosphatase control of Ca[<sup>sup</sup>]2+ signal transduction in airway smooth muscles. Journal of theoretical biology, ISSN 0022-5193, 2008, vol. 252, no. 3, str. 474-481. <http://dx.doi.org/10.1016/j.jtbi.2007.10.005>, doi: 10.1016/j.jtbi.2007.10.005. [COBISS.SI-ID 15856392]