Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Fizika**
Course title:	**Physics**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program Ekologija z naravovarstvom, 1. stopnja		1.	1.
Undergraduate university programme Ecology with Nature Conservation, 1st degree		1st	1st

Vrsta predmeta / Course type	Obvezni/Obligatory
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		**30**			**120**	**6**

Nosilec predmeta / Lecturer:	Aleš Fajmut

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
V celoti opravljene laboratorijske vaje so pogoj za pristop k teoretičnemu izpitu. Vsaka obveznost študenta v načinih ocenjevanja mora biti opravljena s pozitivno oceno.	Completed laboratory exercises are a prerequisite for taking the theoretical exam. Each student requirement within the assessment methods must be completed with a passing grade.

Vsebina:	**Content (Syllabus outline):**
Elektromagnetno valovanje: spektri, izvori, lastnosti, absorpcija, sevanje, ekesperimentalne metode, ki temeljijo na odboju / absorpciji / emisiji / fluorescenci / sipanju EM valovanja, Beer-Lambertov zakon	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
Termodinamika: energijski tok metabolizma, regulacija temperature v človeškem telesu.	Thermodynamics: metabolic energy flow, regulation of body temperature
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; hidrostatika in hidrodinamika; aplikacije Brnoullijeve enačbe, viskoznost, Hagen - Poiseuilleov zakon, Reynoldsovo število; laminarni in turbulentni tokovi.	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, hydrostatics, hydrodynamics, applications of Bernoulli's equation, Hagen – Poiseuille's law, Reynolds's number; laminar turbulent flow
Nihanje: harmonske oscilacije (HO), dušene oscilacije, periodično vzbujanje v HO, oscilacije v bioloških in kemijskih sistemih, samovzdrževane oscilacije, stabilnost	Oscillations: harmonic oscillations (HO), damped HO, periodically forced HO, oscillations in biological and chemical systems, self-sustained oscillations, stability
Zvok: lastnosti zvočnega valovanja, spektri, interval slišnosti, občutljivost ušesa, intenziteta, analiza zvoka, ultrazvočno slikanje	Sound: properties, spectra, interval of hearing, sensitivity of human ear, intensity, analysis of the sound, ultrasound imaging
Moderna fizika: zgradba in model atoma, aplikacije radioaktivnosti in ionizirajočega sevanja, varnost pred sevanji	Modern physics: structure and model of the atom, applicability of radioactivity and ionizing radiation, safety
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.	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
Predavanja so podkrepljena z zahtevnejšimi demonstracijskimi eksperimenti iz področij spektrometričnih in spektroskopskih metod v	The lectures are supported by more advanced demonstration experiments in the fields of spectrometric and spectroscopic methods

različnih delih elektromagnetnega valovanja, radioaktivnosti in mehanike. Laboratorijske vaje s področij mehanike, hidrodinamike ter valovne in geometrijske optike.	across different regions of the electromagnetic spectrum, radioactivity and mechanics. Laboratory exercises from the fields of mechanics, hydrodynamics, as well as wave and geometric optics.

Temeljni literatura in viri / Readings:

1. Newman, J. (2000). *Physics of the life sciences*. Springer.
2. Giancoli, D. C. (1998). *Physics: Principles with applications* (5th ed. or higher). Prentice Hall.
3. Bohinc, K. (2014). *Fizika človeškega telesa*. Zdravstvena fakulteta Univerze v Ljubljani.

Interna skripta in navodila za laboratorijske vaje, izročki prosojnic s predavanj in druga dodatna interna študijska literatura, ki je v elektronski obliki dostopna na: https://estudij.um.si/ v okviru predmeta Fizika.

Pojasnilo/Remark: Med temeljno študijsko literaturo sodijo samo tista poglavja iz omenjenih knjig, ki so del vsebine predmeta v okviru predavanj in laboratorijskih vaj. / Only those chapters from the abovementioned books that are considered within the syllabus outline of the course, including lectures and laboratory work, are regarded as core readings.

Cilji in kompetence:	**Objectives and competences:**
Študent je po uspešno opravljenem izpitu zmožen: - razumeti obravnavane fizikalne teorije in zakone ter jih aplicirati na razlago pojavov in procesov v naravnem okolju, tehniki in v živih bitjih s stališča fizike - strokovnega sodelovanja, komunikacije ter prenosa znanj s področja naravoslovja v interdisciplinarnem okolju	After passing the exam, the student is able: - to understand selected theories and laws from physics and to apply them to interpret the phenomena and processes involved in the natural environment, technology and in living organisms from the physics point of view - of professional cooperation, communication and transfer of knowledge from the field of natural sciences in an interdisciplinary environment
Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Po zaključku predmeta je študent zmožen: - kvalitativno in kvantitativno (s fizikalno-matematičnimi odvisnostmi) opisati obravnavane fizikalne zakone in teorije, jih aplicirati na posamezne konkretne probleme iz naravoslovja in tehnike ter jih rešiti - aplicirati vedenje o fizikalnih pojavih in procesih na konkretne osnovne primere uporabe v naravoslovju, tehniki in medicini	**Knowledge and understanding:** Upon completion of the course, the student is able to: - qualitatively and quantitatively (with physical and mathematical dependencies) describe the physical laws and theories, apply them to particular problems from science and technology and solve them - apply knowledge about physical phenomena and processes to specific basic uses in science,

- samostojno po navodilih pripraviti eksperiment za izbrane meritve, jih izvesti in kvantitativno analizirati izmerjene rezultate - pojasniti posamezne metode merjenja in analize izmerjenih podatkov ter predvideti posamezne rezultate - izgraditi preproste izbrane fizikalno-matematične modele in z njimi napovedati rezultate **Prenesljive/ključne spretnosti in drugi atributi:** - spretnosti za delo z izbrano merilno opremo - sposobnost osnovne kvantitativne analize izmerjenih rezultatov z računalniškimi orodji - sposobnost povezovanja vedenj znotraj naravoslovnih znanosti	technology and medicine - independently prepare an experiment for selected measurements according to the instructions, perform them and quantify the measured results - explain individual methods of measurement and the analysis of measured data and predict some results - build simple physical-mathematical models and to predict results with them **Transferable/Key Skills and other attributes:** - skills for working with selected measuring equipment - ability of basic quantitative analysis of measured data with computer tools - the ability to integrate knowledge within natural sciences

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, podkrepljena s simulacijami, animacijami, reševanjem problemov in z demonstracijskimi eksperimenti Laboratorijske vaje	Lectures, supported by simulations, animations, problem solving and demonstration experiments Laboratory work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Teoretični izpit	80	Theoretical exam
Poročilo	20	Report

Opomba: teoretični izpit (v enakem deležu 80 %) je možno nadomestiti z dvema pisnima kolokvijema, katerih povprečje mora biti večje od 50 %, pri čemer posamezni rezultat ne sme biti manjši od 30 %. V primeru izpolnitve prvega pogoja in neizpolnitve drugega je za priznan pisni del izpita potreben dodatni ustni zagovor.

Note: The theoretical exam (contributing 80% of the final grade) can be replaced by two written midterm tests, whose average score must exceed 50 %, with neither individual score falling below 30 %. If the first condition is met but the second is not, an additional oral examination is required for the written part to be recognized.

Reference nosilca / Lecturer's references:

1. DOBOVIŠEK, Andrej, BLAŽEVIČ, Tina, KRALJ, Samo, FAJMUT, Aleš. Enzyme cascade to enzyme complex phase-transition-like transformation studied by the maximum entropy production principle. Cell reports physical science. 2025, vol. 6, iss. 2, [article no.] 102400, 11 str. ISSN 2666-

3864. https://doi.org/10.1016/j.xcrp.2024.102400, [COBISS.SI-ID 225246211]

2. 2. DOBOVIŠEK, Andrej, VITAS, Marko, BLAŽEVIČ, Tina, MARKOVIČ, Rene, MARHL, Marko, FAJMUT, Aleš. Self-organization of enzyme-catalyzed reactions studied by the maximum entropy production principle. International journal of molecular sciences. 2023, vol. 24, iss. 10, 21 str. ISSN 1422-0067, DOI: 10.3390/ijms24108734 [COBISS.SI-ID 152729603]
3. FAJMUT, Aleš. Molecular mechanisms and targets of cyclic guanosine monophosphate (cGMP) in vascular smooth muscles. V: SAKUMA, Kunihiro (ur.). Muscle cell and tissue : novel molecular targets and current advances. London: IntechOpen, cop. 2021. Str. 1-31. ISBN 978-1-83968-651-1, ISBN 978-1-83968-650-4, ISBN 978-1-83968-652-8. https://www.intechopen.com/chapters/76823, DOI: 10.5772/intechopen.97708. [COBISS.SI-ID 79467011]