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
Enoviti magistrski študijski program druge stopnje Predmetni učitelj		**1**	**2**
Five-year master's degree program Subject Teacher		**1**	**2**

Vrsta predmeta / Course type	Izbirni / Elective
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	**30**		**15**		**105**	**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:**
Ni zahtev.	No prerequisites.

Vsebina:	**Content (Syllabus outline):**
Vsebina predavanj seminarjev in laboratorijskih vaj: 1. Osnove mehanike in biomehanike: kinematika, dinamika, statika in nihanje (mehansko in v bioloških sistemih); translacija in rotacija 2. Energija, energijski tokovi in regulacija temperature 3. Izbrani primeri iz elektrike in magnetizma	Contents of lectures, seminars and laboratory work: 1. Fundamentals of mechanics and biomechanics: kinematics, dynamics, statics and oscillations (mechanical and oscillations in biological systems); translational and rotational motion 2. Energy, energy flows and temperature regulation

4. Zvok in svetloba: osnovne lastnosti snovnega in elektromagnetnega valovanja (EMV) ter njihova aplikacija v naravoslovju, tehniki in medicini; geometrijska optika 5. Atom in atomsko jedro: energijska stanja atomov in molekul, sevanje in absorpcija EMV v snovi; radioaktivnost, ionizirajoča sevanja; uporaba v naravoslovju, tehniki in medicini; 6. Metode slikanj in spektroskopij v naravoslovju, tehniki in medicini: razni mikroskopi in spektrometri, tomografske metode slikanj. 7. Osnove fizikalnih merjenj: metode merjenj, napake pri merjenjih, risanje diagramov, analiza rezultatov, reševanje osnovnih fizikalnih problemov.	3. Selected topics from electricity and magnetism 4. Sound and light: fundamental properties of material waves and electromagnetic waves (EMW) and their application in science, technology and medicine; geometrical optics. 5. Atom and nucleus: atom structure; energy states of atoms and molecules; radiation and absorption of EMW; radioactivity; ionising radiation; applications in science, technology and medicine. 6. Imaging and spectroscopy methods in science, technology and medicine: various microscopes and spectrometers, tomographic methods of imaging. 7. Fundamentals of measurements in physics: measuring methods, errors, drawing of diagrams, analysis of results, problem solving of fundamental assignments in physics.
Laboratorijske vaje: študent samostojno ali v paru opravi 6-7 laboratorijskih vaj iz vsebin predavanj in seminarjev Seminar: sestoji iz zahtevnejših skupinskih in demonstracijskih eksperimentov, ki so podkrepljeni z računalniško analizo meritev in s praktičnimi ter računskimi zgledi	Laboratory work: student individually or in pairs works out 6-7 experimental assignments from the contents of lectures and seminar Seminar: consists of more demanding group and demonstration experiments supported by a computer-based analysis of measurements and problem solving assignments

Temeljni literatura in viri / Readings:

J. Newman: Physics of the Life Sciences, Springer, New York, 2008
R. Kladnik, Visokošolska fizika. 1. del, Mehanski in toplotni pojavi, DZS, Ljubljana, 1985
R. Kladnik, Visokošolska fizika 2. del, Elektrika, atomika, DZS, Ljubljana, 1991
R. Kladnik, Visokošolska fizika. 3. del, Akustika in optika : valovni pojavi, DZS, Ljubljana, 1989
D. C. Giancoli, Physics 4th ed., Prentice Hall, New Jersey, 1995
K. Bohinc, Fizika človeškega telesa. Zdravstvena fakulteta, Univerza v Ljubljani, 2014

Zapiski s predavanj ter navodila za vaje, ki so za študente dostopni na e-študijskem portalu UM: https://estudij.um.si/

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

Cilji in kompetence:	**Objectives and competences:**

Študent je po uspešno opravljenem izpitu zmožen: - razumeti osnovne fizikalne teorije in zakone ter jih aplicirati na razlago pojavov in procesov v naravnem okolju, tehniki in živih bitjih s stališča fizike - strokovnega sodelovanja, komunikacije ter prenosa znanj s področja naravoslovja v interdisciplinarnem osnovnošolskem okolju	After passing the exam, the student is able: - to understand basic theories and laws from physics and to apply them to interpret the phenomena and processes involved in the natural environment, technology and 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 in primary schools

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 narave in tehnike ter jih rešiti - aplicirati vedenje o fizikalnih pojavih in procesih na konkretne osnovne primere uporabe v naravoslovju, tehniki in medicini - 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 **Prenesljive/ključne spretnosti in drugi atributi:** - sposobnost prepoznave problema in iskanja njegove osnovne teoretične in praktične rešitve v okviru elementarne fizike; - spretnosti za delo z izbrano merilno opremo - sposobnost osnovne kvantitativne analize izmerjenih rezultatov z računalniškimi orodji - sposobnost povezovanja vedenj znotraj naravoslovnih znanosti	**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 natural environment and technology and solve them - apply knowledge about physical phenomena and processes to specific basic uses in science, 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 **Transferable/Key Skills and other attributes:** - the ability to identify the problem and to find its basic theoretical and practical solution within elementary physics; - 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 in reševanjem problemov; seminar, ki zajema zahtevnejše skupinske in demonstracijske eksperimente, podkrepljene z	lectures, supported by simulations, animations and problem solving; seminar, which includes more demanding group and demonstration experiments, supported by a computer-based

računalniško analizo meritev; laboratorijske vaje (samostojno delo oz. delo v paru)	analysis of measurements; laboratory work (independent or in pairs)

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni izpit iz vsebin predavanj, seminarja in laboratorijskih vaj	**70**	Written exam from the contents of lectures, seminars and lab. work
Ustni zagovor iz vsebin predavanj, seminarja in laboratorijskih vaj	**20**	Oral exam from the contents of lectures, seminars and lab. work
Poročilo laboratorijskih vaj	**10**	Laboratory work report
Opomba: pisni izpit je možno nadomestiti z dvema pisnima kolokvijema, katerih povprečje mora biti večje od 49%, pri čemer posamezni rezultat ne sme biti manjši od 35 %. V primeru izpolnitve prvega pogoja in neizpolnitve drugega je za priznan pisni del izpita potreben dodatni ustni zagovor.		Note: Written exam can be passed with two mid-term written tests with an average of more than 49%, with an individual score of not less than 35%. In case of the fulfilment of the first condition and the failure of another, an additional oral defence is required for the written exam treated as passed.

Obveznosti študentov:	***Students' commitments:***
(pisni, ustni izpit, naloge, projekti)	*(written, oral examination, coursework, projects):*
• udeležba na laboratorijskih vajah • pisni in ustni izpit	• attendance at laboratory work • written and oral exam

Reference nosilca / Lecturer's references:

1. DOBOVIŠEK, Andrej, MARKOVIČ, Rene, BRUMEN, Milan, FAJMUT, Aleš. The maximum entropy production and maximum Shannon information entropy in enzyme kinetics. Physica. A, Statistical mechanics and its applications, ISSN 0378-4371. [Print ed.], 2018, vol. 496, str. 220-232, doi: 10.1016/j.physa.2017.12.111. [COBISS.SI-ID 23601416],
2. DOBOVIŠEK, Andrej, VITAS, Marko, BRUMEN, Milan, FAJMUT, Aleš. Energy conservation and maximal entropy production in enzyme reactions. Biosystems, ISSN 0303-2647. [Print ed.], 2017, vol. 158, str. 47-56, doi: 10.1016/j.biosystems.2017.06.001. [COBISS.SI-ID 23218696]
3. FAJMUT, Aleš, EMERŠIČ, Tadej, DOBOVIŠEK, Andrej, ANTIĆ, Nataša, SCHÄFER, Dirk, BRUMEN, Milan. Dynamic model of eicosanoid production with special reference to non-steroidal anti-inflammatory drug-triggered hypersensitivity. IET systems biology, ISSN 1751-8849. [Print ed.], 2015, vol. 9, iss. 5, str. 204-215, doi: 10.1049/iet-syb.2014.0037. [COBISS.SI-ID 21404168]
4. GOSAK, Marko, MARKOVIČ, Rene, FAJMUT, Aleš, MARHL, Marko, HAWLINA, Marko, ANDJELIĆ, Sofija. The analysis of intracellular and intercellular calcium signaling in human anterior lens capsule epithelial cells with regard to different types and stages of the cataract. PloS one, ISSN 1932-6203, 2015, vol. 10, iss. 12. http://dx.doi.org/10.1371/journal.pone.0143781, doi: 10.1371/journal.pone.0143781. [COBISS.SI-ID 2645676]