Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Fizikalni eksperimenti 4**
Course title:	**Physics experiments 4**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	**/**	**3**	**5**
Five-year master's degree program Subject Teacher	**/**		

Vrsta predmeta / Course type	Obvezni/Obligatory
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
15			**45**		**30**	**3**

Nosilec predmeta / Lecturer:	Uroš Tkalec

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Predznanje iz Moderne fizike.	Preknowledge of Modern physics.

Vsebina:

1. Predavanja: Vsebine iz Moderne fizike, ki se

neposredno vežejo in so neobhodne za uspešno izvedbo eksperimentov.

2. Laboratorijske vaje: Poskusi z rentgensko

svetlobo, Poskusi z mikrovalovi, Franck-Hertzov poskus, Fotoefekt, Merjenje planckove konstante, Gaussova porazdelitev, Merjenje idealnega izkoristka toplotnega stroja, Difuzija tekočin, Sunkovna jedrska magnetna resonanca, Gama spektroskopija, Michelsonov interferometer, Odklon beta žarkov v elektro-magnetnem polju, Absorpcija beta in gama žarkov.

Content (Syllabus outline):

1. Lectures: Selected topics of Modern physics,

which are directly linked to the experiments, and are thus of immediate importance for the successful execution of laboratory work.

2. Laboratory work: Experiments with Roentgen rays, Experiments with microwaves, Franck-Hertz experiment, Photo-effect, Measurement of the Planck constant, Gaussian distribution,

Measurement of the ideal gain of a heat engine,

Diffusion of liquids, Magnetic resonance

spectroscopy, Gamma ray spectroscopy, Michelson interferometer, Diffraction of beta rays in an electromagnetic field, Absorption of beta and gamma rays.

Temeljni literatura in viri / Readings:

- D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, 5. izdaja, (John Wiley & Sons, Inc., New York, 1997).
- J. Strnad, Fizika, 3. del, (DMFA, Ljubljana, 2002).
- J. Strnad, Fizika, 4. del, (DMFA, Ljubljana, 2005).
- L. Črepinšek, Uvod v moderno fiziko : ucbenik za strojnike, (Visoka tehniška šola, Maribor, 1977).
- Z. Bradač, Naloge iz fizike, (Pedagoška fakulteta, Maribor, 1991).
- V. Kumperščak, Naloge iz moderne fizike, (Visoka tehniška šola, Maribor, 1982).
- B.V. Stanic, Zbirka rešenih zadataka iz atomske fizike, (Nauka, Beograd, 1991).

Cilji in kompetence:

Študentje ponovijo in poglobijo znanje pridobljeno na predavanjih iz Moderne fizike, ki je neobhodno za uspešno izvedbo in razumevanje eksperimentalnih vaj. Seznanijo se z zanimivimi fizikalnimi pojavi, ki poučno demonstrirajo zakone in karakteristike kvantne fizike, fizike jedra, ter moderne optike. Pridobijo si primerne izkušnje in laboratorijske spretnosti, potrebne za samostojno delo pri demonstracijah in eksperimentalnih vajah.

Navadijo se uporabljati ustrezno strokovno

literaturo, svoje teoretično in računsko znanje in tudi druge informacijske vire. Usposobijo se

Objectives and competences:

Students refresh and extend their knowledge

obtained from attending lectures of Modern physics; especially topics that are essential for the successful and correct execution of laboratory work. Moreover, they become acquainted with interesting phenomena

that instructively demonstrate laws of physics related to quantum and nucleus physics, as well as modern optics. Also, students acquire experiences and laboratory skills that are essential for an autonomous

precizno in adekvatno poročati o svojih eksperimentalnih ugotovitvah.	execution of demonstrative physics xperiments related to above-outlined topics. Finally, they learn how to use their theoretical and practical knowledge, as well as information offered from secondary sources, to master problems that might occur during experimental work and report on their findings.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje osnovnih procesov v naravi in sposobnost njihove demonstracije v primerno opremljenem laboratoriju. **Prenesljive/ključne spretnosti in drugi atributi:** Didaktični pristop pri obravnavi naravnih pojavov ter sposobnost prenesti znanje laiku; ali predlagati matematično ali fizikalno rešitev specifičnega problema, ter tako pripomoči k njegovi rešitvi in razvoju v raziskovalno orientiranem okolju.	**Knowledge and understanding:** Understanding of basic processes in nature and the ability to demonstrate them in an appropriately equipped laboratory. **Transferable/Key Skills and other attributes:** A didactic approach to real-life phenomena and the ability to transfer this knowledge to a non-specialist; or to provide a detailed and accurate description of a particular problem and propose mathematically and physically motivated solutions, thus facilitating development in a research oriented environment

Metode poučevanja in učenja:	**Learning and teaching methods:**
Metodika obsega: teoretičen uvod v obravnavano snov ter samostojno izvedbo eksperimentov pod mentorstvom profesorja.	They are based on: theoretical introduction to specific topics and an autonomous execution of experiments under the supervision of the professor.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Opravljene lab. vaje, izdelan dnevnik vaj in sprotno preverjanje pripravljenosti na vajo	**25**	Type (examination, oral, coursework, project): Done experiments and the lab diary, continuous assessments of readiness for the forthcoming experimental task
pisni izpit	**50**	written exam
ustni izpit	**25**	

		oral exam

Reference nosilca / Lecturer's references:

1. SENGUPTA, Anupam, TKALEC, Uroš, RAVNIK, Miha, YEOMANS, Julia M., BAHR, Christian, HERMINGHAUS, Stephan. Liquid crystal microfluidics for tunable flow shaping. Phys. rev. lett., 2013, vol. 110, iss. 4, str. 048303-1-048303-5. http://prl.aps.org/abstract/PRL/v110/i4/e048303. [COBISS.SI-ID 2528868]

2. ROŽIČ, Brigita, TZITZIOS, Vassilios, KARATAIRI, Eva, TKALEC, Uroš, NOUNESIS, George, KUTNJAK, Zdravko, CORDOYIANNIS, George, ROSSO, Riccardo, VIRGA, Epifanio G., MUŠEVIČ, Igor, KRALJ, Samo. Theoretical and experimental study of the nanoparticle-driven blue phase stabilisation. The European physical journal. E, Soft matter, 2011, vol. 34, no. 2, str. 17-27. [COBISS.SI-ID 24522791]

3. TKALEC, Uroš, RAVNIK, Miha, ČOPAR, Simon, ŽUMER, Slobodan, MUŠEVIČ, Igor. Reconfigurable knots and links in chiral nematic colloids. Science (Wash. D.C.), 2011, vol. 333, issue 6038, str. 62-65, doi: 10.1126/science.1205705. [COBISS.SI-ID 2336868]

4. SENGUPTA, Anupam, TKALEC, Uroš, BAHR, Christian. Nematic textures in microfluidic environment. Soft matter, 2011, vol. 7, no. 14, str. 6542-6549. [COBISS.SI-ID 25167143]

5. CORDOYIANNIS, George, LOSADA-PÉREZ, Patricia, PATI TRIPATHI, Chandra Shekhar, ROŽIČ, Brigita, TKALEC, Uroš, TZITZIOS, Vassilios, KARATAIRI, Eva, NOUNESIS, George, KUTNJAK, Zdravko, MUŠEVIČ, Igor, GLORIEUX, Christ, KRALJ, Samo, THOEN, Jan. Blue phase III widening in CE6-dispersed surface-functionalised CdSe nanoparticles. Liq. cryst., 2010, vol. 37, no. 11, str. 1419-1426, ilustr., doi: 10.1080/02678292.2010.519057. [COBISS.SI-ID 24163879]