



Univerza v Mariboru

**FAKULTETA ZA NARAVOSLOVJE  
IN MATEMATIKO**

Koroška cesta 160  
2000 Maribor, Slovenija  
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**UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION**

<b>Predmet:</b>	Fizikalni eksperimenti III
<b>Subject Title:</b>	Physics experiments III

<b>Študijski program</b> Study programme	<b>Študijska smer</b> Study field	<b>Letnik</b> Year	<b>Semester</b> Semester
Izobraževalna fizika Educational Physics	/	3	5

**Univerzitetna koda predmeta / University subject code:**

<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Sem. vaje</b> Tutorial	<b>Lab. vaje</b> Labor work	<b>Teren. vaje</b> Field work	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
			40		110	5

**Nosilec predmeta / Lecturer:**

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

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

Opravljen izpit iz Fizike 4 (Moderna fizika) oziroma temu ekvivalenten kurs fizike na drugi fakulteti in/ali univerzi.

**Prerequisites:**

Done exam of Physics 4 (Modern physics), or alternatively, a certificate confirming the existence of equivalent knowledge obtained from a physics course attended at a different faculty and/or university.

**Vsebina:**

**Content (Syllabus outline):**

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, Fotoefekt, Gaussova porazdelitev, Merjenje idealnega izkoristka toplotnega stroja, Difuzija tekočin, Gama spektroskopija, Michelsonov interferometer, Franck-Hertzov poskus.

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, Photo-effect, Gaussian distribution, Measurement of the ideal gain of a heat engine, Diffusion of liquids, Gamma ray spectroscopy, Michelson interferometer, Franck-Hertz experiment.

#### Temeljni literatura in viri / Textbooks:

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 zadatka iz atomske fizike*, (Nauka, Beograd, 1991).

#### Cilji:

Študentje ponovijo in poglobijo znanje pridobljeno na predavanjih iz Fizike 4 (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 precizno in adekvatno poročati o svojih eksperimentalnih ugotovitvah.

#### Objectives:

Students refresh and extend their knowledge obtained from attending lectures of Physics 4 (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 execution of demonstrative physics experiments 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:

Znanje in razumevanje:

Razumevanje osnovnih procesov v naravi in sposobnost njihove demonstracije v primerno opremljenem laboratoriju.

#### Intended learning outcomes:

Knowledge and Understanding:

**Understanding of basic processes in nature and the ability to demonstrate them in an appropriately equipped laboratory.**

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.

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:**

Teoretičen uvod v obravnavano snov ter samostojna izvedba eksperimentov pod mentorstvom profesorja.

**Learning and teaching methods:**

Theoretical introduction to specific topics and an autonomous execution of experiments under the supervision of the professor.

Delež (v %) /

Weight (in %)

**Načini ocenjevanja:**

**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Type (examination, oral, coursework, project):

Ustni izpit

50%

Oral exam

Pisni izpit

50%

Written exam

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

1. MUŠEVIČ, Igor, ŠKARABOT, Miha, TKALEC, Uroš, RAVNIK, Miha, ŽUMER, Slobodan. Two-dimensional nematic colloidal crystals self-assembled by topological defects. *Science (Wash. D.C.)*, 2006, 313, str. 954-958. [COBISS.SI-ID [1929572](#)]
2. TKALEC, Uroš, ŠKARABOT, Miha, MUŠEVIČ, Igor. Interactions of micro-rods in a thin layer of a nematic liquid crystal. *Soft matter*, 2008, vol. 4, no. 12, str. 2402-2409. [COBISS.SI-ID [22189863](#)]
3. TKALEC, Uroš, RAVNIK, Miha, ŽUMER, Slobodan, MUŠEVIČ, Igor. Vortexlike topological defects in nematic colloids : chiral colloidal dimers and 2D crystals. *Phys. rev. lett.*, 2009, vol. 103, no. 12, str. 127801-1-127801-4. [COBISS.SI-ID [22895655](#)]
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. 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. [COBISS.SI-ID [2336868](#)]