



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

| | |
|----------------------|---------------------------------|
| Predmet: | Fizikalni eksperimenti 3 |
| Course title: | Physics experiments 3 |

| 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 | / | 2 | 4 |
| 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 |
|------------------------|--------------------|------------------|------------------------------|-----------------------------|-------------------------------|------|
| | | | 40 | | 50 | 3 |

Nosilec predmeta / Lecturer:

Robert Repnik

Jeziki / Predavanja / Lectures:

slovenski/Slovene

Languages:

Vaje / Tutorial:

slovenski/Slovene

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

predznanje iz klasične fizike, predvsem iz nihanja, valovanja in optike.

Prerequisites:

Preknowledge of classical physics, especially of oscillations, waves and optics.

Vsebina:

Študent opravi 10 do 12 eksperimentov s področja nihanja in valovanja ter valovne in geometrijske optike. Laboratorijske vaje so iz naslednjih vsebin: dušeno in nedušeno nihanje, vsiljeno nihanje in resonanca, električni nihajni krog, potujoče in stoječe valovanje, leče in zrcala, lečja, uklon in interferenca, spektroskopija, sevanje črnega telesa. Študent tudi pripravi projektno nalogo: načrtuje in izdelava meritve, pripravi navodila za izvajanje meritve in o projektu poroča.

Content (Syllabus outline):

Students perform 10 to 12 experiments from oscillations and waves and from wave and geometrical optics. Experiments are from the following topics: undamped and damped oscillations, forced oscillations and resonance, electrical oscillation circuit, travelling and standing waves, lenses and mirrors, systems of lenses, diffraction and interference, spectroscopy, blackbody radiation. Each student also works on a project. The work involves planning the experiment, building the experiment, performing the measurements and reporting on the project.

Temeljni literatura in viri / Readings:

- 1) Navodila za izvedbo vaj/ Guidelines for the experiments
- 2) Sirkevič, Koškin: Priročnik elementarne fizike. Ljubljana: TZS, 1988.
- 3) D. Halliday, R. Resnick, K. S. Krane, Physics, 5. izdaja, vol 1 in 2 (John Wiley & Sons, Inc., New York, 2002).
- 4) J. Strnad, Fizika, 1. in 2. del, (DMFA, Ljubljana, 2002).
- 5) Na spletnih straneh Oddelka za fiziko objavljena elektronska gradiva./ teaching material published on websites of Department of Physics.

Cilji in kompetence:

Študenti osvežijo in nadgradijo osnovno znanje s področja nihanja in valovanja ter 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. Usvojijo znanja, potrebna za pripravo kvantitativnega in kvalitativnega eksperimenta. Usposobijo se precizno in adekvatno poročati o svojih eksperimentalnih ugotovitvah.

Objectives and competences:

Students refresh and extend knowledge from the field of oscillations and waves and optics. Also, students acquire experiences and laboratory skills that are essential for an autonomous execution of demonstrative physics experiments related to aboveoutlined 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:

Metodika obsega: teoretičen uvod v obravnavano snov ter samostojno izvedbo eksperimentov pod mentorstvom profesorja.

Learning and teaching methods:

They are based on: theoretical introduction to specific topics and an autonomous execution of experiments under the supervision of the professor.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

| Način (pisni izpit, ustno izpraševanje, naloge, projekt) | | Type (examination, oral, coursework, project): |
|--|-----------|--|
| Opravljene laboratorijske vaje, izdelan dnevnik vaj in ustni zagovor vaj | 20 | Done experiments and the lab diary and oral avocation of experiments |
| Ustno ali pisno preverjanje pripravljenosti na vajo | 20 | Oral or written assessment of readiness for the forthcoming experiment |
| Pisni kolokvij | 20 | Written test |
| Projekt | 20 | Project |
| Ustni in praktični izpit | 20 | Oral and practical exam |

Reference nosilca / Lecturer's references:

1. MILFELNER, Maja, AMBROŽIČ, Milan, KRAŠNA, Marjan, CVETKO, Matej, ZIDANŠEK, Aleksander, REPNIK, Robert. Visualization of nematic director field with the RGB color system. *Mol. cryst. liq. cryst. (Phila. Pa. :*

2003), 2012, vol. 553, no. 1, str. 50-57, doi: [10.1080/15421406.2011.609370](https://doi.org/10.1080/15421406.2011.609370). [COBISS.SI-ID [18901000](#)], [JCR, WoS do 6. 5. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 27. 2. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

2. JESENEK, Dalija, GERLIČ, Ivan, VIŠNIKAR, Anja, REPNIK, Robert, KRALJ, Samo. Thin nemantic films : laboratory of physics for topological defects. *Mol. cryst. liq. cryst. (Phila. Pa. : 2003)*, 2012, vol. 553, no. 1, str. 153-160, doi: [10.1080/15421406.2011.609461](https://doi.org/10.1080/15421406.2011.609461). [COBISS.SI-ID [25534503](#)], [JCR, WoS do 6. 10. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 6. 9. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

3. REPNIK, Robert, GERLIČ, Ivan. Liquid crystals and development of natural science competences. *Mol. cryst. liq. cryst. (Phila. Pa. : 2003)*, 2012, vol. 553, no. 1, str. 168-174, doi: [10.1080/15421406.2011.609464](https://doi.org/10.1080/15421406.2011.609464). [COBISS.SI-ID [19420680](#)], [JCR, WoS do 7. 11. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 16. 10. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

4. REPNIK, Robert, POPA-NITA, Vlad, KRALJ, Samo. Mixtures of nanoparticles and liquid crystal phases exhibiting topological defects. *Mol. cryst. liq. cryst. (Phila. Pa. : 2003)*, 2012, vol. 560, iss. 1, str. 115-122, ilustr. <http://www.tandfonline.com/doi/full/10.1080/15421406.2012.663187>, doi: [10.1080/15421406.2012.663187](https://doi.org/10.1080/15421406.2012.663187). [COBISS.SI-ID [19420936](#)], [JCR, WoS do 7. 11. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 16. 10. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

5. KRALJ, Samo, REPNIK, Robert. Patterns in symmetry breaking transitions. V: LAMANAUSKAS, Vincentas (ur.). *Philosophy of mind and cognitive modelling in education - 2012*, (Problems of education in the 21st century, vol. 46). Siauliai: Scientific Methodological Center Scientia Educologica, 2012, str. 74-84, ilustr. [COBISS.SI-ID [19462920](#)]