



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Didaktično-fizikalni praktikum 1
Course title:	Didactical-physical lab 1

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Dvopredmetna izobraževalna fizika	/	1,2	1,3
Double major Educational Physics	/		

Vrsta predmeta / Course type:

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
5			40		75	4

Nosilec predmeta / Lecturer:

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

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

Študenti morajo imeti osnovna znanja iz varnega laboratorijskega dela, osnovna znanja iz splošne didaktike.

Prerequisites:

Students must have basic knowledge of safe laboratory work, basic knowledge of general didactics.

Vsebina:

Content (Syllabus outline):

PR:

Osnove varnega in didaktično ustreznega laboratorijskega dela v osnovni šoli. Kvalitativne in kvantitativne meritve, specifikne samostojnega in skupinskega eksperimentalnega dela. Opremljenost fizikalnega kabineta in učilnice za laboratorijsko delo v osnovni šoli, prva pomoč ob nesrečah, varnostna pravila.

Ergonomija šolskega eksperimentalnega delovnega mesta.

LV:

Izvedba kvalitativnih in kvantitativnih meritev:

- izvedba demonstracijskega, skupinskega in samostojnega domačega (kuhinjska fizika) eksperimentalnega dela na primerih iz fizikalnih področij, predvidenih v učnem načrtu in potrjenih učbenikih za osnovno šolo
- nivojsko izvajanje eksperimentalnega dela, diferenciacija in individualizacija pri osnovnošolskem fizikalnem eksperimentiranju
- problemska zasnovanost eksperimentalnega dela, vloga podpornih materialov in aktivnosti pri tem (navodila za delo, navodila za uporabo pripomočkov, učni in delovni listi, razlaga in razgovor...)
- vloga priprave na izvedbo vaj, razdelitev dela v skupini
- pisno in verbalno poročanje o rezultatih
- razvoj različnih taksonomskih globin znanj ob pripravi in izvajanju eksperimentalnega dela
- uporaba posameznih elementov fizikalne eksperimentalne opreme, uporaba zbirk in priročne opreme
- uporaba računalnika, vmesnikov, senzorjev, druge IKT in multimedijske opreme pri eksperimentalnem delu v osnovni šoli

Projektna naloga:

Samostojno delo: zasnovati in pripraviti motivativno eksperimentalno vajo, izvesti vajo in poročilo o vaji, pripraviti navodila in varnostna opozorila, vajo predstaviti strokovni in laični javnosti ter odgovarjati na vprašanja.

Lectures:

Basics of safe and didactical adequate laboratory work in elementary school. Qualitative and quantitative measurements, specifics of a autonomous and group experimental work. Equipment of physics cabinet and classrooms for laboratory work in elementary school, emergency first aid, safety rules.

Ergonomics of school experimental workplace.

LW:

Implementation of qualitative and quantitative measurements:

- Implementation of a demonstrational, group and autonomous home- (kitchen physics) experimental work on cases of physical fields provided in the curriculum and approved textbooks for elementary school
- Level based implementation of experimental work, individualisation and differentiation in physics experimentation in elementary school
- Problem-based experimental work, the role of supporting materials and activities (work instructions, instructions for use of devices, learning- and worksheets, interpretation and discussion...)
- The role of the preparations for the execution of exercises, the division of labor work within the group
- Written and verbal reporting of results
- Development of different taxonomical depths of knowledge in preparation and implementation of experimental work
- Use of individual components of physics experimental equipment, the use of experimental sets and handy equipment
- Use of computer, interfaces, sensors and other ICT and multimedia equipment in the experimental work in elementary school

Project work:

Autonomous work: to design and prepare a motivative experimental exercise, execute and prepare report, prepare instructions and safety warnings, present exercise to professional and lay public and to answer questions.



Temeljni literatura in viri / Readings:

1. Navodila za izvedbo vaj/ Guidelines for the experiments
2. Znanstveni in strokovni članki v znanstvenih in strokovnih revijah / Scientific and technical papers in scientific and technical journals
3. Učbeniki, priročniki in e-gradiva s področja teme / textbooks, handbooks and e-materials on the chosen topic.
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
6. I. Gerlič. Didaktika pouka fizike v OŠ. PEF MB, 1992.
7. I. Gerlič, V. Udir. Problemski pouk fizike v OŠ. Zavod RS za šolstvo, Ljubljana, 2006.

Cilji in kompetence:

- Študenti poglobijo znanja iz didaktike fizike, natančneje s področja fizikalnega eksperimentiranja v osnovni šoli.

Objectives and competences:

- Students deepen their knowledge in the field of didactics of physics, specifically in the field of physical experimentation in elementary school.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poglobljeno znanje tem s področij didaktike fizike, osredotočeno na fizikalno eksperimentalno delo v osnovni šoli. Razvijejo spretnosti varnega snovanja, izvajanja eksperimentalnih vaj in kompetenco pisnega in verbalnega izražanja pred strokovno in laično javnostjo. Usposobljeni so, da znajo samostojno razvito vajo pripraviti na način, primeren za vključevanje v osnovnošolski pouk fizike. Vešči so izvajanja osnovnih meritev z različnih fizikalnih področij osnovnošolske fizike ter uporabe računalnika z vmesnikom in senzorji pri meritvah.

Intended learning outcomes:

Knowledge and Understanding:

Deeper knowledge in the fields of didactics of physics, focusing on physical experimental work in elementary school. Students develop skills of safe design, execution of experimental exercises and competence in writing and verbal expression in front of professional and lay public. They are able to prepare the self-developed exercise in such a manner, which is suitable for inclusion in the elementary teaching of physics. They are skilled to execute basic measurements of various physical fields of elementary school physics, and use of computer with interface and sensors at measurements.

Prenesljive/ključne spretnosti in drugi atributi: Strokovna in informacijska pismenost. Podajanje znanja za različne razvojne stopnje.	Transferable/Key Skills and other attributes: Scientific and informational literacy. Knowledge communication at different development stages.
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Metode poučevanja in učenja:

Learning and teaching methods:

Multimedijska predavanja Vodeno eksperimentalno delo Problemsko učenje Samostojno terensko in laboratorijsko delo	Multimedia lectures Guided experimental work Problem-based learning Autonomous field and laboratory work
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

a) priprave na vajo b) izdelano poročilo laboratorijskih vaj ter zagovor c) projektna naloga (izdelava in predstavitev)	a) 10 % b) 70 % c) 20 %	a) preparing on exercise b) elaborate a report of laboratory exercises, and defense it c) project work (execution and presentation)
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Reference nosilca / Lecturer's references:

- 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](https://www.cobiss.si/id/18901000)], [ICR, 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]
- 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](https://www.cobiss.si/id/25534503)], [ICR, 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]
- 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](https://www.cobiss.si/id/19420680)], [ICR, 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]
- 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](https://www.cobiss.si/id/19420936)], [ICR, 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]
- 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](#)]