



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fizikalne aplikacije
Course title:	Physical applications

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika 2. st.		1	1
Physics 2 nd degree		1	1

obvezni/compulsory

obvezni/compulsory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30				30	90	5

Nosilec predmeta / Lecturer:

Mitja Slavinec

Jeziki /

Languages:

Predavanja /

Lectures:

Slovenski/Slovenian

Vaje / Tutorial:

Slovenski/Slovenian

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

Ni pogojev.

Prerequisites:

None.

Vsebina:

Na predavanjih bodo predstavljeni primeri uporabe fizike na najrazličnejših področjih v praksi (inženirstvo, biologija, kemija, medicina, ekonomija ...).

V okviru terenskih vaj bo organizirano več ogledov, enodnevnih in večdnevnih strokovnih ekskurzij po Sloveniji in v tujino. Obiskali bomo podjetja, institute, bolnišnice, laboratorije ter izvajali tudi fizikalna opazovanja in meritve v naravi. Podrobneje si bomo ogledali uspešne primere fizikalnih aplikacij, razložili fizikalno ozadje teh primerov in razmišljali o nadgradnji in novih fizikalnih aplikacijah.

Content (Syllabus outline):

Various examples of application of physics will be presented (engineering, biology, chemistry, medicine, economy ...).

In scope of the field work we will organise visits and excursions (one or more days long) in Slovenia or abroad. We plan to visit companies, institutes, hospitals and laboratories. We will further conduct physical observations and measurements in the nature. Some successful examples of applications of physics will be presented closely, their physical background explained and to further thinking about their upgrade and new physical applications will be stimulated.



Poseben pomen bo namenjen fizikalnim ozadjem pri aktualnih razvojnih in tehnoloških prebojih za prihodnost.

Particular importance will be given to the physics' background of current breakthroughs in development and technology for the future.

Temeljni literatura in viri / Readings:

- 1) D. Ewen, R. Nelson, N. Schurter, E. Gundersen, Applied Physics, Prentice Hall, 2005.
- 2) A. Beiser, A. Beiser, Schaum's Outline of Applied Physics, McGraw-Hill Companies, 2004.
- 3) G. S. Romine, Applied Physics: Concepts into Practice, Prentice-Hall, Inc, 2001.
- 4) N. C. Harris; E. M. Hemmerling, Introductory applied physics, McGraw-Hill, 1972.
- 5) C. Guy, D. Fytche: The Principles of Medical Imaging, Imperial College Press, 2005
- 6) B. Schild, H.-F. Casselmann, G. Dahmen, R. Pohlentz: Bauphysik, Vieweg, 1990
- 7) L.E. Kinsler, A.R. Frey, A.B. Coppens, J.V. Sanders: Fundamentals of Acoustics, Wiley 2000
- 8) Revije: Applied physics, New Scientist, ...
- 9) Nekatera aktualna gradiva bodo objavljena tudi na spletnih straneh Oddelka za fiziko <http://www.fizika.uni-mb.si/> / some up to date teaching material will be published on the website of the Department of Physics <http://www.fizika.uni-mb.si/>

Cilji in kompetence:

Študent osvoji praktična znanja in izkušnje, potrebna za kompleksnejše razumevanje fizikalnih pojavov, procesov in reševanje avtentičnih fizikalnih problemov na različnih delovnih področjih in v aplikacijah ter razvije sposobnosti prenašati teoretično fizikalno znanje v uspešne fizikalne aplikacije.

Objectives and competences:

Student gains practical knowledge and experience that is necessary for complex understanding of physical phenomena, processes and for solving authentic physical problems connected to various applications. Student develops skills on how to transfer theoretical knowledge into physical applications.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po uspešno zaključeni učni enoti študent:

- usvoji napredna praktična znanja in izkušnje na različnih delovnih področjih,
- prepozna možnosti aplikacije teoretičnega znanja fizike v kompleksne fizikalne primere v praksi,

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course student:

- acquires advanced practical knowledge and experiences in different fields of activities and applications,
- recognizes opportunities to apply theoretical knowledge of physics to complex physical cases in practice,



<ul style="list-style-type: none">- načrtuje in izvede prenos teoretičnega znanja fizike za reševanje avtentičnih fizikalnih primerov v praksi,- povezuje teoretično znanje fizike z vsebinami na drugih raziskovalnih in strokovnih področjih,- se zaveda pomena aplikacije teoretičnega znanja.		<ul style="list-style-type: none">- plans and conducts transfer of theoretical knowledge to solve authentic physical problems in practice,- connects theoretical knowledge of physics with contents of other reasearch or professional areas,- understands the meaning of application of theoretical knowledge.
Prenesljive/ključne spretnosti in drugi atributi: Predlagati matematično ali fizikalno rešitev specifičnega fizikalnega problema ter tako pripomoči k njegovi rešitvi in razvoju v določeni aplikaciji.		Transferable/Key Skills and other attributes: Solving specific physical problems and facilitating development of a physical application.
Metode poučevanja in učenja: Predavanja (razlaga, razgovor, demonstracija), eksperimentalna predavanja, terensko delo (metoda dela s tekstom, pisnih in grafičnih del, metoda praktičnih del, projektno delo, strokovne ekskurzije) Individualizacija poučevanja. Poučevanje in učenje potekata z didaktično uporabo informacijsko-komunikacijske tehnologije.		Learning and teaching methods: Lectures and experimental lectures (explanation, discussion, demonstration) Field work (work with text, work with graphic elements, practical work, project work, excursions) Individualization in teaching. Teaching and learning are done through the didactic use of ICT.
Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Projektna naloga (izdelek in predstavitev) ustni izpit Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Pozitivna ocena projektne naloge je pogoj za pristop k ustnemu izpitu.	90 % 10 %	Project (work and presentation) Oral exam Each of the mentioned commitments must be assessed with a passing grade. Positive grade of project is a prerequisite for access to the oral exam



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Reference nosilca / Lecturer's references:

- ÜLEN, Simon, GERLIČ, Ivan, SLAVINEC, Mitja, REPNIK, Robert. Evaluating the effectiveness of physlet-based materials in supporting conceptual learning about electricity. *Journal of science education and technology*. 2017, vol. 26, iss. 2, str. 151-160, tabele. ISSN 1059-0145. DOI: [10.1007/s10956-016-9661-1](https://doi.org/10.1007/s10956-016-9661-1).
- SLAVINEC, Mitja, REPNIK, Robert, KLEMENČIČ, Eva. The impact of moisture on thermal conductivity of fabrics = Meritve vpliva vlage na toplotno prevodnost tkanin. *Anali PAZU*. nov. 2016, letn. 6, št. 1/2, str. 8-12.
- KLEMENČIČ, Eva, SLAVINEC, Mitja. Liquid crystals as phase change materials for thermal stabilization. *Advances in condensed matter physics*. 2018, vol. 2018, art. id 1878232, str. 1-8, ilustr. ISSN 1687-8108. DOI: [10.1155/2018/1878232](https://doi.org/10.1155/2018/1878232).
- SLAVINEC, Mitja, ABERŠEK, Boris, GAČEVIĆ, Dino, FLOGIE, Andrej. Monodisciplinarity in science versus transdisciplinarity in STEM education. *Journal of Baltic science education*. 2019, vol. 18, no. 3, str. 435-449, graf. prikazi. ISSN 1648-3898. DOI: [10.33225/jbse/19.18.435](https://doi.org/10.33225/jbse/19.18.435).
- FISTER, Iztok, IGLESIAS, Andres, GÁLVEZ, Akemi, DEL SER, Javier, OSABA, Eneko, FISTER, Iztok, PERC, Matjaž, SLAVINEC, Mitja. Novelty search for global optimization. *Applied mathematics and computation*. [Print ed.]. 2019, vol. 347, str. 865-881. ISSN 0096-3003. DOI: [10.1016/j.amc.2018.11.052](https://doi.org/10.1016/j.amc.2018.11.052).