



Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Uporabna fizika
Course title: Applied Physics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika, 1. stopnja		3	5
Physics, 1st cycle			

Vrsta predmeta / Course type

obvezni/compulsory

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	60	4

Nosilec predmeta / Lecturer:

Mitja Slavinec

Jeziki / Predavanja / Lectures: Slovenski/Slovenian
Languages: Vaje / Tutorial: Slovenski/Slovenian

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

Priporočeno je predznanje s področij klasične in moderne fizike.

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno. Opravljena seminarska naloga je pogoj za pristop k pisnemu izpitu. Pozitiven pisni izpit je pogoj za pristop k ustnemu izpitu.

Prerequisites:

Recommended is preknowledge from classical and modern physics.

Each of the listed obligations in the assessment methods must be completed with a positive grade. Completed seminar paper is a prerequisite for taking the written exam. A positive grade of the written exam is a prerequisite for taking the oral exam.

Vsebina:

Na predavanjih bodo predstavljene aktualne vsebine iz fizike in primeri uporabe fizike v praksi. Predstavljene bodo možnosti uporabe fizike v najrazličnejših področjih gospodarstva in vsakdanjega življenja.

Content (Syllabus outline):

In theoretical part will be presented topical themes of physics and examples of use of physics in practice. There will be presented possibilities of application of physics in different fields of economy and everyday living.

Študenti bodo dobili pregled nad osnovnimi fizikalnimi principi in tehnološkimi izvedbami različnih aparatur in merilnih tehnik ter možnosti njihovega nadaljnega razvoja. V okviru terenskih vaj bodo organizirani ogledi in strokovne ekskurzije po Sloveniji in v tujini. Študenti bodo obiskali podjetja, inštitute, bolnišnice, laboratorije in druge institucije, kjer se bodo seznanili z vsebinami in tehnološkimi procesi uporabne fizike, kot npr. laserska tehnika, NMR, radiologija in podobno.	There will be presented basic overview of physical principle and technologic applications of different equipment, measurement techniques and possibility of their future development. In part of the field work will be organised visits and expert excursions in Slovenia or abroad. Students will visit companies, institutes, hospitals, laboratories and other institutions, where will be introduced with applied physics and technological process corresponding with applied physics, like for example, laser technique, NMR, radiology etc.
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Temeljni literatura in viri / Readings:

- 1) M. S. Rogalski, S. B. Palmer, Advanced University Physics, Chapman & Hall/CRC, Boca Raton, 2006.
- 2) J. Strnad, Fizika. Del 1, Mehanika, Toplota, DMFA – založništvo, Ljubljana, 2014.
- 3) J. Strnad, Fizika. Del 2, Električna, Optika, DMFA – založništvo, Ljubljana, 2015.
- 4) J. Strnad, Fizika. Del 3, Posebna teorija relativnosti, Kvantna fizika, Atomi, DMFA – založništvo, Ljubljana, 2018.
- 5) J. Strnad, Fizika. Del 4, Molekule, Kristali, Jedra, delci, DMFA – založništvo, Ljubljana, 2018.

Opomba: Obravnavane teme se bodo vsako leto spreminjale, zato bodo aktualni temeljni viri posredovani na predavanjih. Nekatera gradiva bodo sproti objavljena tudi v spletni učilnici.

Comment: The topics will be different each year. The relevant textbooks will thus be given at the lectures. Some of the teaching material will also be available in the e-classroom.

Dodatna literatura /Additional 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.

Cilji in kompetence:

Študent osvoji praktična znanja in izkušnje, potrebna za razumevanje fizikalnih pojavov, procesov in reševanje realnih fizikalnih problemov na različnih delovnih področjih in v aplikaciji. Ter razvije sposobnost prenašati

Objectives and competences:

Student achieves practical knowledge and experiences that are necessary for understanding of physical phenomena, processes and solving real physical problems in different fields of activities and in applications.



Fakulteta za naravoslovje
in matematiko

teoretično fizikalno znanje v uspešne fizikalne aplikacije.

Student conquers ability to transfer theoretical physical knowledge into physical applications.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po uspešno zaključeni učni enot študent:

- usvoji praktična znanja in izkušnje na različnih delovnih področjih,
- prepozna možnosti aplikacije teoretičnega znanja fizike v prakso,
- načrtuje in izvede prenos teoretičnega znanja fizike v prakso,
- povezuje teoretično znanje fizike z vsebinami na drugih raziskovalnih in strokovnih področjih,
- se zaveda pomena aplikacije teoretičnega znanja.

Prenesljive/ključne spretnosti in drugi atributi:

Študent:

- pridobi znanja potrebna za oblikovanje predloga postopka reševanja ali rešitve specifičnega fizikalnega problema
- razvije spretnosti samostojnega in skupinskega strokovno-raziskovalnega dela,
- razvije spretnosti komuniciranja in poročanja o svojem projektnem delu drugim.

Intended learning outcomes:

Knowledge and understanding:

On completion of this course student:

- acquires practical knowledge and experiences in different fields of activities and applications,
- recognizes opportunities to apply theoretical knowledge of physics,
- plans and conducts transfer of theoretical knowledge,
- connects theoretical knowledge of physics with contents of other research or professional areas,
- understands the meaning of application of theoretical knowledge.

Transferable/Key Skills and other attributes:

Student:

- acquires knowledge necessary for formulating a proposal of solution process or solution of specific physical problem,
- develops skills of independent and group professional and research work,
- develops communication skills and reporting about project work to others.

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)
Individualizacija poučevanja
elementi obrnjenega 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)
Individualization in teaching.
Elements of flipped learning

Teaching and learning are done through the didactic use of ICT.



Fakulteta za naravoslovje
in matematiko

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

projekt	25	project
pisni izpit	25	written exam
ustni izpit	50	oral exam

Reference nosilca / Lecturer's references:

HÖLBL, Arbresha, PAL, Kaushik, SLAVINEC, Mitja, KRALJ, Samo. Slave-master mechanism of thermotropic liquid crystal phase transitional behavior. *Physica. B, Condensed matter*. [Print ed.]. Oct. 2022, vol. 642, str. 1-8. ISSN 0921-4526. DOI: [10.1016/j.physb.2022.414142](https://doi.org/10.1016/j.physb.2022.414142). [COBISS.SI-ID [117878531](https://cobiss.si/id/117878531)]

KLEMENČIČ, Eva, ZAVEC PAVLINIČ, Daniela, SLAVINEC, Mitja. Modelling the impact of moisture on the thermal conductivity of cotton jersey. *Fibres & textiles in Eastern Europe : an international magazine devoted to current problems of the textile industries in Central and Eastern Europe*. 2021, vol. 29, iss. 2 (146), str. 61-65. ISSN 1230-3666. <http://www.fibtex.lodz.pl/article2286.html>, DOI: [10.5604/01.3001.0014.6083](https://doi.org/10.5604/01.3001.0014.6083). [COBISS.SI-ID [60647427](https://cobiss.si/id/60647427)]

LI, Wen-Jing, JIANG, Luo-Luo, CHEN, Zhi, PERC, Matjaž, SLAVINEC, Mitja. Optimization of mobile individuals promotes cooperation in social dilemmas. *Chaos, solitons and fractals*. [Print ed.]. Dec. 2020, vol. 141, str. 1-7. DOI: [10.1016/j.chaos.2020.110425](https://doi.org/10.1016/j.chaos.2020.110425). [COBISS.SI-ID [37159939](https://cobiss.si/id/37159939)]

HÂNCEAN, Marian-Gabriel, SLAVINEC, Mitja, PERC, Matjaž. The impact of human mobility networks on the global spread of COVID-19. *Journal of complex networks*. [Online ed.]. Dec. 2020, vol. 8, iss. 6, 14 str. ISSN 2051-1329. DOI: [10.1093/comnet/cnaa041](https://doi.org/10.1093/comnet/cnaa041). [COBISS.SI-ID [55149571](https://cobiss.si/id/55149571)]