



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fizika okolja
Course title:	Environmental Physics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Dvopredmetna izobraževalna fizika	/	2	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
45				30	75	5

Nosilec predmeta / Lecturer:

Jeziki /	Predavanja / Lectures:	<input type="text" value="Slovenski/Slovene"/>
Languages:	Vaje / Tutorial:	<input type="text" value="Slovenski/Slovene"/>

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

Prerequisites:

Vsebina:

Content (Syllabus outline):

1. Fizikalni procesi in pojavi v okolju

Atmosferski procesi in pojavi ter njihov vpliv na zemeljsko površje (sončev spekter, sklopitev med svetlobo in snovjo, biološke molekule, ozon in UV svetloba)

Klima in klimatske spremembe (vreme in klima, modeliranje klimatskih sprememb).

Obravnava fizikalnih procesov in pojavov v okolju (transport polutantov, difuzija, tok v rekah, podzemnih vodah, morski tokovi, enačba dinamike tekočin, gore, gozd, urbana središča, potresna območja, vulkani, tektonika, erozija, ...).

Vpliv biosfere na fizikalne procese v okolju (biogeokemijska kroženja, mikroklima, ...).

2. Fizikalni procesi in pojavi v različnih tehniških aplikacijah

Obravnava fizikalnih procesov in pojavov v tehniških aplikacijah in njihov vpliv na okolje (elektrarne, bivalni objekti, pristanišča, zadrževalniki, transportna sredstva, družba in okolje, politika in okoljevarstvo, preprečevanje katastrof, akustika in človekovo zaznavanje zvoka, kriteriji hrupa, zmanjševanje prepustnosti zvoka, aktivna kontrola zvoka ...)

3. Fizika energijskih virov

Od kod energija na Zemlji in energijski viri (obnovljivi, neobnovljivi).

Energijski viri v Sloveniji.

Jedrska energija (zlitje in cepitev jeder, varnost in sevanje, jedrski odpadki)

Alternativni energijski viri.

Varčna in okolju prijazna raba energijskih virov.

4. Fizika ravnanja z odpadki

Opadki v gospodinjstvih.

Opadki v industriji.

Posebni odpadki (jedrski, kemični, biološki in drugi odpadki).

Transport, shranjevanje in razgradnja različnih vrst odpadkov.

5. Ekoremediacije

1. Physical processes and phenomena in different environments

Atmospheric processes and phenomena and their influence on Earth's surface (solar wind, coupling between light and matter, biological molecules, ozone and UV light)

Climate and climate changes (weather and climate, modeling of climate changes).

Treatment of physical processes and phenomena in environment (transport of pollutants, diffusion, flow in rivers, underground waters, sea currents, equations of dynamics of fluids, mountains, forest, urban centers, earthquake areas, volcanoes, tectonics, erosion, ...).

Biosphere and its influence on physical processes in the environment (biogeochemical cycles, microclimate, ...).

2. Physical processes and phenomena in different technical applications

Treatment of physical processes and phenomena in technical applications and their influence on environment (power plants, objects for residence, harbors, reservoir, means of communication, society and environment, policy and environment protection, prevention of disasters, acoustic and human's perception of sound, criteria of noise, decreasing of transition of sound, active control of sound ...)

3. Physics of energy sources

Origin of energy on earth and energy sources (renewable, not renewable).

Energy sources in Slovenia.

Nuclear energy (fission and fusion of nuclei, security and radiation, radioactive waste)
Alternative energy sources.

Economic and environmental-friendly use of energy sources.

4. Physics of dealing with waste

Waste in housekeeping.

Waste in industry.

Special waste (nuclear, chemical, biological and other waste).

Uporaba biotskih sistemov v okoljskih tehnologijah.

Predmet se izvaja v sodelovanju z Mednarodnim centrom za ekoremediacije, gostujoči strokovnjak prof. ddr. Ana Vovk-Korže.

Transport, keeping and decomposition of different types of wastes.

5. Ecoremediations

The application of biotic systems in environmental technologies.

The subject is performed in collaboration with the International center for ecoremediations; collaboration with the expert Prof. Dr. Ana Vovk-Korže.

Temeljni literatura in viri / Readings:

- 1) E. Boeker, R. Grondelle, Environmental Physics: Sustainable Energy and Climate Change, John Wiley & Sons, New York 2011.
- 2) J. Monteith M. Unsworth, Principles of Environmental Physics: Plants, Animals, and the Atmosphere, Academic Press 2013.
- 3) M. Dželalija, Environmental Physics, University of Molise, University of Split, Valahia University of Targoviste, Split 2004.
- 4) Članki v revijah New Scientist, Scientific World in Computational Physics
- 5) Nekatera aktualna gradiva bodo objavljena na spletnih straneh Oddelka za fiziko <http://www.fizika.unimb.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:

Študentje osvojijo znanja, potrebna za kompleksnejše razumevanje fizikalnih pojavov in procesov v okolju. Na različnih primerih iz naravnih in tehniških okolij spoznajo pomen in vrste energijskih virov ter energijskih pretvorb. Spoznajo vrste odpadkov in kako jih okolju prijazno transportiramo ter hranimo. Spoznajo možnost uporabe bioloških sistemov za trajnostni razvoj.

Objectives and competences:

Students achieve knowledge that is necessary for complex understanding of physical phenomena and processes in environment. On different examples from natural or technical environments they understand importance and kinds of energy sources and energy transitions. Students conquest knowledge about different types of wastes and how we environment friendly transport and keep them. They learn about the use of biological systems in sustainable development.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje kompleksnih naravnih pojavov in procesov v okolju. Poznavanje pomena in vrste energijskih virov in energijskih pretvorb, pomen transporta in hranjenja odpadkov.

Intended learning outcomes:

Knowledge and Understanding:

Understanding of complex physical phenomena and processes in environment. Knowing the importance and types of energy sources and energy transformation, types of waste, its transportation and deposition.

Prenesljive/ključne spretnosti in drugi atributi: Predmet pripravlja študenta za delo na fizikalnih projektih s področja okoljevarstva

Transferable/Key Skills and other attributes: Subject prepares the student for work on some physics projects in environment.

Metode poučevanja in učenja:

Learning and teaching methods:

Metodika obsega: teoretičen uvod v obravnavano snov ter terenske vaje v različnih naravnih in tehnoloških okoljih.

They are based on: theoretical introduction to specific topics and exercises in different natural or technical environments.

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

- projektna naloga	50	- project
- ustni izpit	50	- oral exam

Reference nosilca / Lecturer's references:

Izbrani članki / Selected publications:

ZIDANŠEK, Aleksander, AMBROŽIČ, Milan, MILFELNER, Maja, BLINC, Robert, LIOR, Noam. Solar orbital power : sustainability analysis. *Energy (Oxford)*. [Print ed.], 2011, vol. 36, no. 4, str. 1986-1995.

GREGORIČ, Asta, ZIDANŠEK, Aleksander, VAUPOTIČ, Janja. Dependence of radon levels in the Postojna Cave on outdoor air temperature. *Nat. hazards earth syst. sci. (Print)*, 2011, vol. 11, no. 5, str. 1523-1528.

KABASHI, Skender, BEKTESHI, Sadik, AHMETAJ, Skender, KABASHI, Gazmed, NAJDOVSKI, Dimitrij, ZIDANŠEK, Aleksander, ŠLAUS, Ivo. Effects of Kosovo's energy use scenarios and associated gas emissions on its climate change and sustainable development. *Appl. energy*. [Print ed.], 2010, vol. 88, no. 2, str. 473-478.

ZIDANŠEK, Aleksander, BLINC, Robert, JEGLIČ, Anton, KABASHI, Skender, BEKTESHI, Sadik, ŠLAUS, Ivo. Climate changes, biofuels and the sustainable future. *Int. j. hydrogen energy*. [Print ed.], 2009, vol. 34, no. 16, str. 6980-6983.

CORDOYIANNIS, George, KRALJ, Samo, KUTNJAK, Zdravko, JESENEK, Dalija, MUŠEVIČ, Igor, ZIDANŠEK, Aleksander. Different modulated structures of topological defects stabilized by adaptive targeting nanoparticles. *Soft matter*, 2013, vol. 9, no. 15, str. 3956-3964, doi: [10.1039/C3SM27644A](https://doi.org/10.1039/C3SM27644A). [COBISS.SI-ID [26557223](https://www.cobiss.si/id/26557223)]

48 objav v Web of Science, H-indeks 14, v zadnjih 5 letih nosilec 3 mednarodnih in 3 slovenskih projektov / 48 publications in Web of Science, H-index 14, in the last 5 years lead researcher of 3 international and 3 national projects

