

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
Fizika		5	9
Physics			

Vrsta predmeta / Course type Izbirni / elective

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: Aleksander Zidanšek

Jeziki /	Predavanja / Lectures:	slovenski/Slovenian in/and angleški/English
Languages:	Vaje / Tutorial:	slovenski/Slovenian in/and angleški/English

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

Ni zahtev. Priporočeno znanje klasične in moderne fizike.

Prerequisites:

None. Recommended knowledge of classical and modern physics.

Vsebina:

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,...).

Content (Syllabus outline):

1. Physical processes and phenomena in different environments Atmospheric processes and phenomena and their influence on earths surface (solar wind, coupling between light and matter, biological molecules, ozone and UV light)Climate and climatic changes (weather and climate, modeling of climatic changes). Treating 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, tectonic, erosion,...). Biosphere and its influence on physical rocesses in the environment (biogeochemical cycles, microclimate,...).

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
Odpadki v gospodinjstvih. Odpadki v industriji. Posebni odpadki (jedrski, kemični, biološki in drugi odpadki). Transport, shranjevanje in razgradnja različnih vrst odpadkov.

5. Ekoremediacije
Uporaba biotskih sistemov v okoljskih tehnologijah.

2. Physical processes and phenomena in different technical applications
Treating 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 environmentally 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). Transport, keeping and decomposition of different types of wastes.

5. Ecoremediations
The application of biotic systems in environmental technologies.

Temeljni literatura in viri / Readings:

- 1) M. Dželalija, Environmental Physics, CreateSpace Independent Publishing Platform, 2014.
- 2) E. Boeker, R. Grondelle, Environmental Physics, John Wiley & Sons, New York 2011.
- 3) J. Monteith M. Unsworth, Principles of Environmental Physics, Academic Press, 2013.
- 4) Članki v revijah New Scientist, Scientific World in Computational Physics
- 5) Nekatera aktualna gradiva bodo objavljena na spletnih straneh Oddelka za fiziko / Some up to date teaching material will be published on the website of the Department of Physics

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 in razumejo pomen in vrste energijskih virov ter energijskih pretvorb. Spoznajo vrste odpadkov in razumejo, kako jih okolju prijazno transportiramo ter hranimo.

Objectives and competences:

Students gain 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. They understand different types of waste and how to safely transport and store them.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Razumevanje kompleksnih naravnih pojavov in procesov v okolju.

Razumevanje pomena in vrste energijskih virov in energijskih pretvorb.

Razumevanje vrste odpadkov ter transporta, odlaganja in hranjenja odpadkov.

Prenesljive/ključne spretnosti in drugi atributi:

Študent je pripravljen za delo na fizikalnih projektih s področja okoljevarstva.

Intended learning outcomes:**Knowledge and understanding:**

Understanding of complex physical phenomena and processes in environment.

Understanding the importance and types of energy sources and energy transformation.

Understanding types of waste, its transportation, disposal and storage.

Transferable/Key Skills and other attributes:

The student is prepared for work on physics projects in the field of environment.

Metode poučevanja in učenja:

Razlaga, razgovor, demonstracija, študij primerov, problemsko učenje ter terensko delo

Learning and teaching methods:

Lecture, discussion, demonstration, case studies, problem based learning, field work.

Načini ocenjevanja:

projektna naloga
ustni ali pisni izpit

Delež (v %) /

Weight (in %)

Assessment:

Načini ocenjevanja	Delež (v %) / Weight (in %)	Assessment
projektna naloga	50	project
ustni ali pisni izpit	50	oral or written exam

Reference nosilca / Lecturer's references:

- ABINA, Andreja, PUC, Uroš, JEGLIČ, Anton, ZIDANŠEK, Aleksander. Structural characterization of thermal building insulation materials using terahertz spectroscopy and terahertz pulsed imaging. *NDT & E International*, ISSN 0963-8695. [Print ed.], 2016, vol. 77, str. 11-18, doi: 10.1016/j.ndteint.2015.09.004. [COBISS.SI-ID 28983847]
- PUC, Uroš, ABINA, Andreja, SLUBAN, Melita, ZIDANŠEK, Aleksander, JEGLIČ, Anton, VALUŠIS, Gintaras. Terahertz spectroscopic identification of explosive and drug simulants concealed by various hiding techniques. *Applied optics*, ISSN 1559-128X. Tiskana izd., 2015, vol. 54, no. 14, str. 4495-4502, doi: 10.1364/AO.54.004495. [COBISS.SI-ID 28541735]
- PUC, Uroš, ABINA, Andreja, JEGLIČ, Anton, ZIDANŠEK, Aleksander, KAŠALYNAS, Irmantas, VENCKEVIČIUS, Rimvydas, VALUŠIS, Gintaras. Spectroscopic analysis of melatonin in the terahertz frequency range. *Sensors*, ISSN 1424-8220, 2018, vol. 18, no. 12, str. 4098-1-4098-12, doi: 10.3390/s18124098. [COBISS.SI-ID 31962407]
- 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.

[COBISS.SI-ID 26557223]

- JAZBINŠEK, Mojca, PUC, Uroš, ABINA, Andreja, ZIDANŠEK, Aleksander. Organic crystals for THz photonics. *Applied sciences*, ISSN 2076-3417, 2019, vol. 9, no. 5, str. 882-1-882-45, doi: 10.3390/app9050882. [COBISS.SI-ID 32214055]