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
Enovit magistrski študijski program druge stopnje **Predmetni učitelj**		**5**	**9**
Five-year master's degree program **Subject Teacher**			

Vrsta predmeta / Course type	Obvezni / Obligatory
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		**15**		**15**	**75**	**5**

Nosilec predmeta / Lecturer:	Aleksander Zidanšek

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Ni zahtev. Priporočeno je predznanje klasične in moderne fizike. Pogoji za opravljanje študijskih obveznosti: Opravljen projekt je pogoj za pristop k pisnemu izpitu, opravljen pisni izpit pa pogoj za pristop k ustnemu izpitu. Za uspešno zaključeno učno enoto mora biti vsak del posebej pozitiven.	None. Preknowledge of classical and modern physics is recommended. Conditions for Fulfilling Study Obligations: The completed project assignment is a prerequisite for admission to the written exam and completed written exam is required for admission to the oral exam. For a successfully completed course, each part of the assessment has to be positive.

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

Temeljni literatura in viri / Readings:

1) J. Monteithm M. Unsworth, Principles of Environmental Physics, Academic Press, 2013.
2) E. P. Harris, Introduction to Environmental Sciences and Sustainability, University of West Florida Pressbooks, 2023, https://open.umn.edu/opentextbooks/textbooks/introduction-to-environmental-sciences-and-sustainability
3) Strnad, J. (2014). *Fizika. Del 1* (12. natis, Let. 9, str. 281). DMFA - založništvo.
4) Kuščer, I., & Žumer, S. (2017). *Toplota, Termodinamika, statistična mehanika, transportni pojavi* (3. natis, Let. 28, str. 219). DMFA - založništvo.

Dodatna literatura / Additional Readings

1) Gaberšek, S., Skok, G., & Žabkar, R. (2013). *Rešene naloge iz osnov meteorologije* (2. natis, Let. 46, str. 85). DMFA - založništvo.
2) Članki v revijah New Scientist, Scientific World in Computational Physics

Cilji in kompetence:	**Objectives and competences:**
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.	Students acquire 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:	**Intended learning outcomes:**
Znanje in razumevanje: Po zaključku predmeta študent: - razume kompleksne naravne pojave in procese v okolju, energetiki in ravnanju z odpadki, - zna opisati okoljske sisteme, pojave in procese s fizikalnimi modeli, - je sposoben meriti fizikalne parametre v okolju in jih interpretirati, - analitično in numerično reši fizikalne modele okoljskih sistemov.	**Knowledge and understanding:** Upon completion of the course, the student: - understands complex physical phenomena and processes in the environment, energetics, and waste management; - can describe environmental systems, phenomena, and processes with physical models; - is able to measure physical parameters in the environment and interpret the obtained measurements; - analytically and numerically solves physical models of environmental systems.
Prenesljive/ključne spretnosti in drugi atributi: Študent je sposoben uporabe analitičnih in računalniških orodij za reševanje kompleksnih fizikalnih problemov. Prav tako se zaveda pomena varovanja okolja in je pripravljen za delo na fizikalnih projektih s področja okoljevarstva.	**Transferable/Key Skills and other attributes:** The students are able to use analytical and numerical tools to solve complex physics problems. They are also aware of the importance of environmental protection and capable to work on physics projects in the field of environment.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Razlaga, razgovor, demonstracija, študij primerov, problemsko učenje ter terensko delo	Lecture, discussion, demonstration, case studies, problem based learning, field work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
projekt	**30**	project
pisni izpit	**30**	written exam
ustni izpit	**40**	oral exam

Reference nosilca / Lecturer's references:

1. ZID, Maha, PAL, Kaushik, HARKAI, Saša, ABINA, Andreja, KRALJ, Samo, ZIDANŠEK, Aleksander. Qualitatively and quantitatively different configurations of nematic–nanoparticle mixtures. *Nanomaterials*. [Online ed.]. 2024, vol. 14, issue 5, str. 1-16. ISSN 2079-4991. DOI: 10.3390/nano14050436. [COBISS.SI-ID 187069955]

2. ABINA, Andreja, PUC, Uroš, JAZBINŠEK, Mojca, ZIDANŠEK, Aleksander. Analytical gas sensing in the terahertz spectral range. *Micromachines*. 2023, vol. 14, str. 1-38, ilustr. ISSN 2072-666X. https://www.mdpi.com/2072-666X/14/11/1987, DOI: doi.org/10.3390/mi14111987. [COBISS.SI-ID 170582019]

3. ZIDANŠEK, Aleksander, HÖLBL, Arbresha, RANJKESH SIAHKAL, Amid, CORDOYIANNIS, George, KUTNJAK, Zdravko, KRALJ, Samo. Impact of random-field-type disorder on nematic liquid crystalline structures. *The European physical journal. E., Soft matter.* 2022, vol. 45, no. 7, str. 63-1-63-12, ilustr. ISSN 1292-895X. DOI: 10.1140/epje/s10189-022-00217-y. [COBISS.SI-ID 116649731]

4. VASUDEVAN, Aswathy, SHVALYA, Vasyl, KOŠIČEK, Martin, ZAVAŠNIK, Janez, JUROV, Andrea, SANTHOSH, Neelakandan Marath, ZIDANŠEK, Aleksander, CVELBAR, Uroš. From faceted nanoparticles to nanostructured Thin Film by Plasma-Jet Redox Reaction of Ionic Gold. *Journal of alloys and compounds*. [Print ed.]. Dec. 2022, vol. 928, [article no.] 167155, str. 1-11, ilustr. ISSN 0925-8388. DOI: 10.1016/j.jallcom.2022.167155. [COBISS.SI-ID 121112067]