UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Fizikalni procesi v okolju
Course title:	Physical Processes in Environment

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika 2. st.		2	**3**
Physics 2nd degree		2	3

Vrsta predmeta / Course type izbirni/ optional

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
15			15	15	105	5

Nosilec predmeta / Lecturer: Aleksander Zidanšek

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski/Slovenian
	Vaje / Tutorial:	slovenski/Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Ni zahtev. Priporočeno znanje osnov fizike in fizike okolja.	None. Recommended basic knowledge of classical physics and physics of environment.

Vsebina:

1. Fizikalni procesi in pojavi v okolju

Matematični opis in modeliranje fizikalnih procesov: gradientne relacije, ki poganjajo tokove (snovni, toplotni, električni); dinamika tekočin, reakcijski in transportni sistemi, transport in difuzija polutantov, tokovi v morju, rekah, podzemnih vodah; vpliv biosfere na fizikalne procese v okolju, ...

2. Atmosferski procesi in pojavi

Atmosferski procesi in pojavi ter njihov vpliv na zemeljsko površje (spekter Sončevega sevanja, sevalno ravnovesje v atmosferi, učinek tople grede, ozon in UV svetloba, sončni veter).
Klima in klimatske spremembe (vreme in klima, modeliranje lokalne in globalne klime).

3. Izbrane fizikalne meritve v okolju

3.1 Osnovne meritve

Meritve temperature, tlaka in vlažnosti zraka.
Meritve hrupa.
Meritve radioaktivnosti.

3.2 Elementarna spektroskopija

Masna spektroskopija, NMR spektroskopija, optična spektroskopija, laserska spektroskopija (Lidar), težke kovine, plinska kromatografija.

3.3 Nedestruktivno iskanje polutantov

Content (Syllabus outline):

1. Physical processes and phenomena in environment

Mathematical description and modeling of physical processes: gradient relations in mass, heat and electric currents; dynamics of fluids, reaction and transport systems, transport and diffusion of pollutants, flow sea, rivers, underground waters; biosphere and its influence on physical processes in the environment, …

2. Atmospheric processes and phenomena

Atmospheric processes and phenomena and their influence on Earth surface (Solar radiation spectrum, radiation equilibrium in the atmosphere, greenhouse effect, ozone and UV light, Solar wind)
Climate and climatic changes (weather and climate, modeling of local and global climate).

3. Selected physical measurements in envoronment

3.1 Basic measurements

Measurements of temperature, pressure and humidity.
Masurements of noise.
Measurements of radioactivity ~~in ecosystems.~~

3.2 Elementary Spectroscopy

Georadar, magnetometer, magnetogradiometer, indukcijski senzor.	Mass spectroscopy, NMR spectroscopy, Optical spectroscopy, Laser spectroscopy (Lidar), heavy metals, gass chromatography. 3.3 Nondestructive search of pollutants Georadar, magnetometer, magnetogradiometer, induction sensor.

Temeljni literatura in viri / Readings:

1) John Houghton, Nigel Mason, Peter Hughes, Randall McMullan, Ross Reynolds, Lester Simmonds, John Twidell, Introduction to Environmental Physics: Planet Earth, Life and Climate, CRC Press, Boca Raton 2001.
2) Egbert Boeker, Rienk van Grondelle, Environmental Physics, John Wiley & Sons, New York 2011.
3) Članki v revijah New Scientist, Scientific World in Computational Physics
4) Na spletnih straneh Oddelka za fiziko objavljena elektronska gradiva / teaching material published on websites of Department of Physics

Cilji in kompetence:	**Objectives and competences:**
Študentje osvojijo znanja, potrebna za kompleksnejše razumevanje in matematično modeliranje fizikalnih pojavov in procesov na različnih primerih iz naravnega okolja in klimatskega sistema. Spoznajo tudi osnovne merske metode za meritve v okolju.	Students achieve knowledge that is necessary for complex understanding and mathematical modeling of physical phenomena and processes, using different examples from natural environment and climate system. Students also learn basic methods for measurements in environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razume kompleksne naravne pojave in procese v okolju. Razume klimatske modele, jih zna ovrednotiti in analizirati rezultate. Zasnuje in izvede različne fizikalne meritve v okolju. Prenesljive/ključne spretnosti in drugi atributi: Predmet pripravlja študenta za delo na projektih s področja okolja.	Knowledge and Understanding: The students understand complex physical phenomena and processes in environment. They understand climate models, can evaluate them and analyze the results. They design and performs various physical measurements in environment. Transferable/Key Skills and other attributes: Subject prepares the student for work on 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:
projektna naloga ustni izpit	50 % 50 %	project oral examination

Reference nosilca / Lecturer's references:

1. ABINA, Andreja, PUC, Uroš, ZIDANŠEK, Aleksander. Challenges and opportunities of terahertz technology in construction and demolition waste management. Journal of environmental management. 2022, vol. 315, str. 115118-1-115118-8, ilustr. ISSN 0301-4797. DOI: 10.1016/j.jenvman.2022.115118. [COBISS.SI-ID 105906947]
2. ABINA, Andreja, BATKOVIČ, Tanja, CESTNIK, Bojan, KIKAJ, Adem, KOVAČIČ LUKMAN, Rebeka, KURBUS, Maja, ZIDANŠEK, Aleksander. Decision support concept for improvement of sustainability-related competences. Sustainability. 2022, vol. 14, iss. 14, str. 8539-1-8539-21, ilustr. ISSN 2071-1050. DOI: 10.3390/su14148539. [COBISS.SI-ID 115791875]
3. JOZIČ, Primož, ZIDANŠEK, Aleksander, REPNIK, Robert. Fuel conservation for launch vehicles: Falcon Heavy case study. Energies. 2020, vol. 13, no. 3, str. 1-10. ISSN 1996-1073. DOI: 10.3390/en13030660. [COBISS.SI-ID 25125640]