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			

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 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 znanje osnov fizike in fizike okolja.	None. Recommended basic knowledge of classical physics and physics of environment.

Vsebina:	**Content (Syllabus outline):**
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, ...	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. Atmosferski procesi in pojavi Atmosferski procesi in pojavi ter njihov vpliv na zemeljsko površje (spekter Sončevega sevanja, sevalno ravnovesje v atmosferi, učinek tople	2. Atmospheric processes and phenomena Atmospheric processes and phenomena and their influence on Earth surface (Solar radiation spectrum, radiation equilibrium in the

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 Georadar, magnetometer, magnetogradiometer, indukcijski senzor.	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 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	Knowledge and Understanding: The students understand complex physical phenomena and processes in environment. They understand climate models, can evaluate

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.	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:

- 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]
- VASUDEVAN, Aswathy, SHVALYA, Vasyl, ZIDANŠEK, Aleksander, CVELBAR, Uroš. Tailoring electrical conductivity of two dimensional nanomaterials using plasma for edge electronics : a mini review. *Frontiers of Chemical Science and Engineering*. 13 (**3**): 427-443, 2019, 17 str. ISSN 2095-0179. DOI: 10.1007/s11705-019-1805-4. [COBISS.SI-ID 32306471]
- 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]