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.		1,2	2,3
Physics 2nd degree		1,2	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
45	0	0	30	15	60	5

Nosilec predmeta / Lecturer: Aleksander Zidanšek

Jeziki / Languages:		
	Predavanja / Lectures:	Slovenski/Slovene
	Vaje / Tutorial:	Slovenski/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Predznanje osnov fizike in fizike okolja.	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 Meritve onesnaženja

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
Mass spectroscopy, NMR spectroscopy, Optical spectroscopy, Laser spectroscopy (Lidar), heavy

Meritve koncentracije polutantov v zraku: - SO2, NOx, ozon, prašni delci... Meritve težkih kovin: - svinec, živo srebro, kadmij, cink, železo, baker, krom, nikelj, selen, arzen... 3.4 Fizikalne meritve biotskih procesov v okolju Metode in tehnike meritev biotskih parametrov v okolju, kot so primarna produkcija, sestava združb, vegetacijski indeksi, stres,... Eksperimentalni del poteka v sodelovanju z Inštitutom za fizikalno biologijo, gostujoči strokovnjak dr. Alexis Zrimec.	metals, gass chromatography 3.3 Measurements of pollution Measurements of concentration of pollutants in air: - SO2, NOx, ozone, dust particles... Measurements of heavy metals: - lead, mercury, cadmium, zinc, iron, copper, chromium, nickel, selenium, arsenic … 3.4. Physical measurements of biotic processes in the environment Methods and measurement techniques of biotic parameters in the environment, such as primary production, community composition, vegetation indices, stress assessment,… Experimental work is done in collaboration with the Institute of physical biology; collaboration with the expert dr. Alexis Zrimec.

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 Science: Physical Principles and Applications, John Wiley & Sons, New York 2001.
3) T. G. Gallam, Louis J. Gross, Mathematical Ecology, World Scientific, Singapore, 1988.
4) E. Boeker, R. Grondelle, Environmental Physics, John Wiley & Sons, New York 1995.
5) Članki v revijah New Scientist, Scientific World in Computational Physics
6) 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: Razumevanje kompleksnih naravnih pojavov in procesov v okolju. Poznavanje klimatskih modelov in razumevanje klimatskih sprememb. Pregledno znanje o meritvah v okolju. Prenesljive/ključne spretnosti in drugi atributi: Predmet pripravlja študenta za delo na fizikalnih projektih s področja okolja.	Knowledge and Understanding: Understanding of complex physical phenomena and processes in environment. Knowing the basic climate models and understanding of climate change. Knowledge of basic measurements in environment. 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, seminarske in terenske vaje v različnih naravnih okoljih.	They are based on: theoretical introduction to specific topics, tutorial work and field work comprising also exercises in different natural environments.

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

Reference nosilca / Lecturer's references:

KRALJ, Samo, CORDOYIANNIS, George, JESENEK, Dalija, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, NOVAK, Nikola, AMENITSCH, Heinz, KUTNJAK, Zdravko. Dimensional crossover and scaling behavior of a smectic liquid crystal confined to controlled-pore glass matrices. Soft matter, 2012, vol. 8, issue 8, str. 2460-2470, doi: 10.1039/C1SM06884A. [COBISS.SI-ID 25534759]

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. [COBISS.SI-ID 24602919]

CORDOYIANNIS, George, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, KUTNJAK, Zdravko, AMENITSCH, Heinz, NOUNESIS, George, KRALJ, Samo. Influence of confinement in controlled-pore glass on the layer spacing of smectic-A liquid crystals. Phys. rev., E Stat. nonlinear soft matter phys. (Print), 2009, vol. 79, no. 5, str. 051703-1-051703-7. [COBISS.SI-ID 22602791]

KRALJ, Samo, CORDOYIANNIS, George, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, AMENITSCH, Heinz, ŽUMER, Slobodan, KUTNJAK, Zdravko. Presmectic wetting and supercritical-like phase behavior of octylcyanobiphenyl liquid crystal confined to controlled-pore glass matrices. J. chem. phys., 2007, vol. 127, no. 15, str. 154905-1-154905-9. [COBISS.SI-ID 21141287]

BLINC, Robert, SELIGER, Janez, ZIDANŠEK, Aleksander, ŽAGAR, Veselko, MILIA, Fani, ROBERT, Hector. [sup](14)N nuclear quadrupole resonance of some sulfa drugs. Solid state nucl. magn. reson.. [Print ed.], 2006, vol. 30, str. 61-68. [COBISS.SI-ID 20015655]