Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

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				**30**	**75**	**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 klasične in moderne fizike.	Preknowledge of classical and moder physics
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	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,

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 aplikacijahObravnava 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. Predmet se izvaja v sodelovanju z Inštitutom za fizikalno biologijo, gostujoči strokovnjak dr. Alexis Zrimec	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 applicationsTreating 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 environmental-friendly use of energy sources. 4. Physics of dealing with wasteWaste 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 environmetal technologies. The subject is performed in collaboration with the Institute of physical biology; collaboration with the expert dr. Alexis Zrimec.

Temeljni literatura in viri / Readings:

1) E. Boeker, R.Grondelle, Environmental Physics, John Wiley & Sons, New York 1995.

2) J. Monteithm M. Unsworth, Principles of Environmental Physics, Elsevier, Burlington 1990.

3) C. Smith, Environmental Physics, Taylor & Francis, New York 2002.

4) Članki v revijah New Scientist, Scientific World in Computational Physics

5) Nekatera aktualna gradiva bodo objavljena na spletnih straneh Oddelka za fiziko http://www.fizika.unimb.si/ / Some up tp date teaching material will be published on the website of the Department of Physics http://www.fizika.uni-mb.si/

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 pomen in vrste energijskih virov ter energijskih pretvorb. Spoznajo vrste odpadkov in kako jih okolju prijazno transportiramo ter hranimo. Spoznajo možnost uporabe bioloških sistemov za trajnostni razvoj.

Objectives and competences:

Students achieve 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. Students conquest knowledge about different types of wastes and how we environment friendly transport and keep them. They learn about the use of biollogical systems in sustainable development.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje kompleksnih naravnih pojavov in

procesov v okolju. Poznavanje pomena in vrste

energijskih virov in energijskih pretvorb, pomen transporta in hranjenja odpadkov.

Prenesljive/ključne spretnosti in drugi atributi:

Predmet pripravlja študenta za delo na fizikalnih projektih s področja okoljevarstva.

Intended learning outcomes:

Knowledge and understanding:

Understanding of complex physical phenomena and processes in environment. Knowing the importance and types of energy sources and energy transformation, types of waste, its transportaion and deposition.

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 ter terenske vaje v različnih naravnih in tehnoloških okoljih.	They are based on: theoretical introduction to specific topics and exercises in different natural or technical environments.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
projektna naloga	**50**	project
ustni ali pisni izpit	**50**	oral or written exam

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]