

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	Energija za človekovo uporabo
<b>Course title:</b>	Energy for Human Use

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 2 <sup>nd</sup> degree		1,2	2,3

**Vrsta predmeta / Course type**

**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
30	0	0	15	15	90	5

**Nosilec predmeta / Lecturer:**

<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	Slovenski/Slovenian in/and angleški/english
	<b>Vaje / Tutorial:</b>	Slovenski/Slovenian in/and angleški/english

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

**Prerequisites:**

**Vsebina:**

**1. Energija**  
Energija v fiziki, viri energije

**2. Osnove termodinamike**  
Energijski zakon, prenos toplote; energija iz fosilnih goriv; toplotni stroji; shranjevanje in transport energije.

**3. Termodinamske omejitve energijskih pretvorb**  
Entropijski zakon, motor z notranjim izgorevanjem, izkoristek

**4. Okoljski učinki pridobivanja energije**  
Energija in okolje: zmanjševanje onesnaženja; cena energijskih transformacij.  
Obnovljivi energijski viri: sončna toplota, energija vetra, valovi, biološki viri energije.  
Jedrska energija: zlitje, cepitev, varnost in sevanje, jedrski odpadki in varnost.  
Gorivne celice: gorivne celice z membrano za izmenjavo protonov; energijski viri za gorivne celice.  
Vodik: biološki viri pridobivanja, bakterije in alge.

**Content (Syllabus outline):**

**1. Energy**  
Energy in physics, sources of energy

**2. Fundamentals of Thermodynamics**  
Energy law, heat transfer; fossile fuel energy; heat engine; storage and transport of energy.

**3. Thermodynamic Limits of Energy Transformatinos**  
Enthropy law, internal combustion engine, energy efficiency

**4. Environmental Effects of Energy Production**  
Energy and natural environment: reduction of pollution; price of energy transformations.  
Renewable energy sources: solar energy, wind energy, tidal energy, biological sources of energy.  
Nuclear energy: fusion, fision, safety and radiation, nuclear waste and security.  
Fuel cells: proton exchange membrane fuel cells.  
Hydrogen: biological sources, bacteria and algae.

**Temeljni literatura in viri / Readings:**

1. Jefferson W. Tester, Michael J. Driscoll, William A. Peters, Elisabeth M. Drake, Michael W. Golay , Sustainable Energy: Choosing among Options, MIT Press, Cambridge 2005 .
2. Egbert Boeker, Rienk van Grondelle, Environmental Science: Physical Principles and Applications, John Wiley & Sons, New York 2001.
3. J. Nelson, Physics of Solar Cells, Imperial College Press. London 2003.
4. Članki v revijah New Scientist, Scientific World in Computational Physics

**Cilji in kompetence:**

Kandidat spozna načine kroženja energije v naravi in vpliv človekove rabe energije na okolje.

Kandidat spozna predvsem tiste energijske vire, ki so do okolja prijazni, in tiste, ki predstavljajo potencialno nevarnost za okolje. Kandidat se nauči objektivno in kritično presojati vpliv posameznih načinov pridobivanja energije na ljudi in okolje.

**Objectives and competences:**

Students learn about energy flows in nature and the environmental impact of human energy use.

Students learn new environmentally friendly energy sources, as well as those that represent potential risks for environment. The candidates also learn to assess critically the impact of different energy sources on humans and environment.

**Predvideni študijski rezultati:**

Znanje in razumevanje:  
Razumevanje načinov kroženja in pridobivanja energije ter vpliva energijskih virov na okolje.

Prenesljive/ključne spretnosti in drugi atributi:  
Predmet pripravlja študenta za delo na fizikalnih projektih s področja energetike in okoljevarstva.

**Intended learning outcomes:**

Knowledge and Understanding:  
Understanding of energy flow and production as well as the environmental impact of energy sources.

Transferable/Key Skills and other attributes:  
Subject prepares the student for work on some physics projects in energy and environmental protection.

**Metode poučevanja in učenja:**

Metodika obsega: teoretičen uvod v obravnavano snov, laboratorijske in terenske vaje v različnih naravnih okoljih.

**Learning and teaching methods:**

They are based on: theoretical introduction to specific topics, laboratory and field work comprising also exercises in different natural environments.

**Načini ocenjevanja:**

projektna naloga  
ustni ali pisni izpit

Delež (v %) /  
Weight (in %)

**Assessment:**

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</sup>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]