

OBNOVLJIVI VIRI IN SUROVINE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Obnovljivi viri in surovine
Course title:	Sustainable Resources and Raw Materials
Članica nosilka/UL	UL FKKT
Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Kemijska tehnologija, prva stopnja, visokošolski strokovni	Ni členitve (študijski program)	2. letnik, 3. letnik	zimski ali poletni	izbirni

Univerzitetna koda predmeta/University course code: 0643419

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	15				75	5

Nosilec predmeta/Lecturer: doc. dr. Mitja Mori, doc. dr. Tina Skalar, izr. prof. dr. Igor Pušnik

Vrsta predmeta/Course type: izbirni strokovni/Elective Professional

Jeziki/Languages:

Predavanja/Lectures:	Slovenščina
Vaje/Tutorial:	

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

Študent mora imeti predmet opredeljen kot študijsko obveznost.	Prerequisites: The course has to be assigned to the student.
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Vsebina:

- Povezovanje in poznavanje osnovnih pojmov s področja energetike, transporta, kemijske in procesne industrije
- Klasifikacija virov in surovin (obnovljivi, neobnovljivi)
- Vrste obnovljivih virov in njihova dostopnost izrabe (primarna, sekundarna)
- Zgodovinski pregled izkoriščanja virov, vpliv socialnih, ekonomskih in družbenih sprememb na vrsto, način in količino njihove izrabe
- Ocena trenutna izkoriščenost, zaloge in potrebe po virih na svetovni ravni in dejavniki, ki vplivajo na njihove spremembe
- Vpliv preskrbe z energijo na okolje (študije življenjskih ciklov tehnologij in procesov) in družbo
- Osnove procesov pridobivanja končne energije

Content (Syllabus outline):

- Connecting and knowledge of fundamental concepts from energy, transportation, chemistry, and process industries
- Classification of resources and raw materials (renewable, non-renewable)
- Types of renewable resources and their uses (primary, secondary)
- Historical review of resource use, the impact of societal, economic, and social changes on the type, manner, and extent of use
- Assessment of current uses, stocks, and demands of resources on a global scale and factors affecting their changes
- Impact of energy supply on the environment (life cycle studies of technologies and processes) and society

<p>(energija iz fosilnih goriv, vetra, sonca, vode, jedrska energija, geotermalna energija)</p> <ul style="list-style-type: none"> - Učinkovitejša raba energije v kemijski industriji - Skladiščenje in distribucija energije in surovin v kemijski industriji - Trajnostni viri v kemijski industriji in možnosti za zeleni prehod (surovin, električne energije, odpadne toplote) - Pospeševanje zelenega prehoda s termokemijskimi procesi, orientiranimi za prestrazanje sekundarnih surovin in sočasno proizvodnjo energije in energentov - Osnove energetskih sistemov, omrežij, distribucije električne energije, analiza njihove razpoložljivosti in energetske učinkovitosti - Vodik energijski vektor in uporaba vodikovih tehnologij v energetiki 	<ul style="list-style-type: none"> - Fundamentals of final energy production processes (energy from fossil fuels, wind, solar, hydro, nuclear, geothermal) - More efficient use of energy in the chemical industry - Storage and distribution of energy and raw materials in the chemical industry - Sustainable resources in the chemical industry and options for a green transition (raw materials, electricity, waste heat) - Accelerating the green transition through thermochemical processes focused on the recovery of secondary raw materials and the simultaneous production of energy and energy products - Fundamentals of energy systems, grids, electricity distribution, analysis of their availability and energy efficiency - Hydrogen energy vector and application of hydrogen technologies in the energy sector
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Temeljna literatura in viri/Readings:

- F. W. Wellmer, Raw materials for future energy supply, Springer, 2019, 225 strani.
- J. O'Connor, B. Noble, T. Lieuwen, Renewable Fuels, Sources, Conversion, and Utilization, Cambridge University Press, 2023, 566 strani.
- Znanstvena literatura pridobljena za pripravo seminarjev v okviru tega predmeta.

Cilji in kompetence:

- Študent pozna stanje obnovljivih virov in surovin na svetovnem trgu.
- Prepozna potrebe in zmožnosti na področju pridobivanja in zagotavljanja virov.
- Obvlada glavne vire energije in surovin in njihove procese pridobivanja in distribucije.
- Seznanjen je s problematiko vpliva na okolje in družbo ter možnosti optimizacije.
- Kandidat je sposoben identificirati in reševati osnovne probleme zagotavljanja virov z upoštevanjem njihove smotrne rabe v smeri zelenega prehoda.
- Študent je zmožen konstruktivne in strokovne komunikacije z vključevanjem različnih profilov strokovnjakov na tem področju (inženirji elektrotehnike, strojnimi inženirji, ...)

Objectives and competences:

- The student knows the situation of renewable raw materials and resources in the world market.
- Recognizes the needs and opportunities in the area of resource procurement and supply.
- Masters the main sources of energy and raw materials and their extraction and distribution processes. - Knows the impact on the environment and society and the optimization options. - The candidate is able to identify and solve the basic problems of resource provision, taking into account their rational use in terms of the green transition. - The student is able to communicate constructively and professionally, involving different profiles of experts in the field (electrical engineers, mechanical engineers, ...)

Predvideni študijski rezultati:

Znanje in razumevanje

Študent spozna osnovne procese pridobivanja energije, jih med seboj primerjati in predlagati optimizacije. Sposoben je opraviti izračun osnovnih masnih in energetskih bilanc procesa in zna preučiti njihov vpliv na okolje in družbo.

Uporaba

Znanja mu omogočajo konstruktivno interdisciplinarno komunikacijo in reševanje problemov s področja učinkovitega izkoriščanja virov

Intended learning outcomes:

Knowledge and Comprehension

The student learns about the basic processes of energy production, compares and optimizes them with each other. Student is able to calculate the basic mass and energy balances of the process and can examine their impact on the environment and society.

Application

His knowledge enables constructive interdisciplinary communication and problem solving in the field of efficient resource utilization in chemical technology.

<p>v kemijski tehnologiji.</p> <p>Refleksija Študent je zmožen povezati že pridobljena znanja s področja matematike, fizike, mehanskih operacij, procesov v industrijski kemiji in jih nadgraditi na področju zelene izrabe energije in učinkovite rabe drugih virov in surovin.</p> <p>Prenosljive spretnosti Študent je usposobljen implementirati že znane tehnologije za zeleni prehod v tehnologije uporabe obnovljivih virov in jih nadgraditi z do sedaj osvojenim znanjem. Pri študiju razvija kritičen način razmišljanja, kar mu koristi pri reševanju okoljskih problemov, ki zahtevajo upravljanje z različnimi viri.</p>	<p>Analysis Student will be able to link previously acquired knowledge in the fields of mathematics, physics, mechanics, industrial chemistry processes and expand them in the field of green energy use and efficient use of other resources and raw materials.</p> <p>Skill-transference Ability The student is empowered to implement already known technologies for green transition to renewable resource technologies and expand them with the knowledge acquired so far. During studies, student develops a critical thinking skills useful in solving environmental problems that require the management of various resources.</p>
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<p>Metode poučevanja in učenja: Predavanja in seminarji. Predavanja se lahko v obsegu do 15 ur izvedejo v drugih oblikah poučevanja (na daljavo, konzultacije, strokovni obisk industrije).</p>	<p>Learning and teaching methods: Lectures and seminars. Lectures of up to 15 hours may be delivered through other forms of instruction (distance learning, consultations, professional visits to industry).</p>
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Načini ocenjevanja:	Delež/Weight	Assessment:
Pogoj za pristop k pisnemu izpitu je uspešno izdelana seminarska naloga (napisana seminarska naloga in predstavitev).	20,00 %	Prerequisite for participation in the written examination is a successfully completed seminar paper (written seminar paper and presentation).
Pisni izpit	80,00 %	Written exam

Reference nosilca/Lecturer's references:

SKALAR, Tina, ZUPAN, Klementina, MARINŠEK, Marjan. Microstructure tailoring of combustion-derived Ni-GDC and Ni-SDC composites as anode materials for intermediate temperature solid oxide fuel cells. *Journal of the Australian Ceramic Society*. Mar. 2019, vol. 55, iss. 1, str. 123-133, ilustr. ISSN 2510-1579.

SKALAR, Tina, LUBEJ, Martin, MARINŠEK, Marjan. Optimization of operating conditions in a laboratory SOFC testing device. *Materiali in tehnologije*. [Tiskana izd.]. št. 5, 2015, str. 731-738. ISSN 1580-2949.

SKALAR, Tina, MAČEK, Jadran, GOLOBIČ, Amalija. A new simple synthesis and characterization of Sm-doped ceria and its homogeneous precursor $Ce_{0.80}Sm_{0.20}(Ac)_3(Gly)_n$. *Journal of the European ceramic society*. 2012, vol. 32, no. 10, str. 2333-2339. ISSN 0955-2219.

Univerzitetni, visokošolski ali višješolski učbenik z recenzijo

PUŠNIK, Igor. Preskušanje in energetska učinkovitost. Ljubljana: Fakulteta za elektrotehniko, Laboratorij za metrologijo in kakovost, 2016. 2 zv. (160 str.; 190 str.), ilustr. [COBISS.SI-ID 11821908]

ŠTUKELJ, Marina, HAJDINJAK, Melita, **PUŠNIK, Igor.** Stress-free measurement of body temperature of pigs by using thermal imaging : useful fact or wishful thinking. *Computers and electronics in agriculture*. [Online ed.]. 2022, vol. 193, art. no. 106656, str. 1-14, ilustr. ISSN 1872-7107. <https://www.sciencedirect.com/science/article/pii/S0168169921006736?via%3Dihub>, [COBISS.SI-ID 93839363]

PUŠNIK, Igor, GERŠAK, Gregor. Evaluation of the size-of-source effect in thermal imaging cameras. *Sensors*. Jan.-2 2021, iss. 2, 607, str. 1-22, ilustr. ISSN 1424-8220. <https://www.mdpi.com/1424-8220/21/2/607>, [COBISS.SI-ID 47911683]

MORI, Mitja, GUTIÉRREZ, Manuel, SEKAVČNIK, Mihael, DROBNIČ, Boštjan. Modelling and

environmental assessment of a stand-alone micro-grid system in a mountain hut using renewables. *Energies*. 2022, vol. 15, iss. 1, str. 1-21, ilustr. ISSN 1996-1073. <https://www.mdpi.com/1996-1073/15/1/202>, DOI: 10.3390/en15010202. [COBISS.SI-ID 91685379]

MORI, Mitja, GUTIÉRREZ, Manuel, CASERO, Pedro. Micro-grid design and life-cycle assessment of a mountain hut's stand-alone energy system with hydrogen used for seasonal storage. *International journal of hydrogen energy*. [Print ed.]. Aug. 2021, vol. 46, iss. 57, str. 29706-29723, ilustr. ISSN 0360-3199. <https://www.sciencedirect.com/science/article/pii/S0360319920344013>, DOI: 10.1016/j.ijhydene.2020.11.155. [COBISS.SI-ID 41896707]

ŠTROPNIK, Rok, SEKAVČNIK, Mihael, FERRIZ, Ana María, **MORI, Mitja**. Reducing environmental impacts of the ups system based on PEM fuel cell with circular economy. *Energy*. 2018, vol. 165, part b, str. 824-835, ilustr. ISSN 0360-5442. <https://www.sciencedirect.com/science/article/pii/S0360544218319790?via%3Dihub>, DOI: 10.1016/j.energy.2018.09.201. [COBISS.SI-ID 16276763]

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