ENERGETIKA V KROŽNEM GOSPODARSTVU

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Energetika v krožnem gospodarstvu
Course title:	Energy supply in circular economy
Članica nosilka/UL Member:	UL FS

Študijski programi in stopnja	**Študijska smer**	**Letnik**	**Semestri**	**Izbirnost**
Strojništvo - Razvojno raziskovalni program, druga stopnja, magistrski (od študijskega leta 2024/2025 dalje)	Energetsko strojništvo (smer)	2. letnik	1. semester	obvezni

Univerzitetna koda predmeta/University course code:	0566864
Koda učne enote na članici/UL Member course code:	6009-M

Predavanja /Lectures	**Seminar /Seminar**	**Vaje /Tutorials**	**Klinične vaje /Clinical tutorials**	**Druge oblike študija /Other forms of study**	**Samostojno delo /Individual student work**	**ECTS**
30		30			65	5

Nosilec predmeta/Lecturer:	Mitja Mori, Tine Seljak, Tomaž Katrašnik

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	Obvezni strokovni predmet na smeri Energetsko strojništvo, ki je izbirni strokovni predmet na ostalih smereh./Compulsory specialised course in the study of Energy engineering, which is an elective specialised course in other fields of study.

Jeziki/Languages:	Predavanja/Lectures:	Slovenščina
	Vaje/Tutorial:	Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Izpolnjevanje pogojev za vpis v Magistrski študijski program II. stopnje Strojništvo - Razvojno raziskovalni program.	Meeting the enrollment conditions for the Master's study programme of Mechanical Engineering - Research and Development program.

Vsebina:	**Content (Syllabus outline):**

1. Uvod
  1. Osnovni principi krožnega gospodarstva (kroženje snovi, energije in informacij)
  2. Kriteriji, indikatorji: energijska, snovna in ekonomska učinkovitost
  3. Vzporednice s klasičnimi pristopi
  4. Strategije prehoda na krožno gospodarstvo
2. Energijski tokovi v krožnem gospodarstvu
  1. Sistematizacija virov energije s primerjalno analizo tehnologij
  2. Diagram energijskih tokov za posamezne vire in države: kronološki, urejeni
  3. Časovno usklajevanje energijskih tokov
  4. Razpoložljivost proizvodnih virov: energijska, časovna in močnostna
  5. Praktični primeri
3. Gospodarnost ukrepov na prehodu
	1. Introduction
	  1. Basic principles of circular economy (material, energy and information looping).
	  2. Criteria and indicators for circular economy: energy efficiency, material efficiency, economic efficiency.
	  3. Comparative analysis to linear economy.
	  4. Strategies for transition into circular economy
	2. Energy flows in circular economy.
	  1. Classification of energy sources with comparative analysis of available technologies for energy conversion.
	  2. Energy flow charts for local, regional and global energy sources: chronological and load duration curve
	  3. Stability of power supply and system demand
	  4. Availability of power generation sources: energy-, time- and

v krožno gospodarstvo
    1. Stroški, struktura specifičnih stroškov, lastna cena, izračun
    2. Gospodarska upravičenost naložbe: neto denarni tokovi, neto sedanja vrednost, interna stopnja donosa
    3. Praktični primeri
4. Energijski tokovi v proizvodnih procesih
    1. Racionalno izkoriščanje energijskih virov
    2. Ukrepi racionalne rabe energije v gospodarstvu (faktor obremenitve, regeneracija energije, izkoriščanje odpadnih toplot, zmanjševanje lastne rabe)
    3. Energetski pregledi: izračun okoljskih in ekonomskih učinkov, energetsko knjigovodstvo
    4. Praktični primeri z izračuni
5. Uvajanje obnovljivih virov energije v krožno gospodarstvo
    1. Vprašanja izravnave energijskih tokov
    2. Uvajanje ukrepov aktivnega odjema
    3. Proizvajalci & Odjemalci = ‘Prodjemalci’ (Prosumers)
    4. Elementi virtualnih elektrarn in pametnih energetskih omrežij
    5. Praktični primeri z izračuni
6. Tehnologije za prehod med materialnim in energijskim krogom.
    1. Razpoložljive tehnologije za konverzijo in rekonverzijo snovnih tokov v energijske tokove (termična in termokemična pretvorba, kemična reciklaža, tehnologije za pretvorbo CO2), ključne značilnosti.
    2. Področja uporabe posameznih tehnologij.
    3. Omejitve tehnologij in fleksibilnost.
    4. Okoljski učinki
    5. Razvoj, snovanje in optimizacija tehnologij, ki omogočajo

power- related availability.
    5. Case studies.
3. Energy management during transition into circular economy.
    1. Costs, structure of specific costs, leas cost of energy, calculations.
    2. Economic justification of investment: net cash flow, net present value, internal rate of return.
    3. Case studies.
4. Energy flows in industral processes.
    1. Rational use of resuorces.
    2. Measures for rational industrial energy use: load factor, regeneration, waste heat recovery, reduction of auxiliary energy consumption.
    3. Energy audits: evaluation of environmental and economic impacts, energy accounting.
    4. Case studies with calculations.
5. Introduction of renewable energy sources in circular economy
    1. Grid stability challenges.
    2. Employing demand side management techniques.
    3. Multi-functional players in energy market: Producers & Consumers = Prosumers.
    4. Elements of virtual power plants and smart grids.
    5. Case studies with calculations.
6. Technologies for coupling material and energy cycles.
    1. Available technologies for conversion and reconversion of material streams in energy streams (thermal and thermochemical conversion, chemical recycling, technologies for CO2 conversion), key characteristics.
    2. Applicable use areas for different conversion technologies.
    3. Limitations and flexibility of conversion technologies.
    4. Environmental impact.

okoljsko sprejemljivo pridobivanje energije v krožnem gospodarstvu.

7. Osnove snovanja energetskih tehnologij v krožnem gospodarstvu.
    1. Osnove reakcijskih poti pirolize, uplinjanja in plazemskih tehnologij.
    2. Osnove sinteze novih energentov (surovin)
    3. Metode vrednotenja lastnosti materialov, proces izbire ustreznih poti pretvorbe.
    4. Valorizacija snovnih tokov.
8. Sektorsko sklapljanje
    1. Izraba presežnih energijskih tokov iz OVE za ‘proizvodnjo’ nizkoogljičnih nosilcev energije
    2. Energijski vektorji, ki temeljijo na vodiku (energetika + transport) in njihova uporaba kot vstopne surovine za kemijsko industrijo
    3. Hranilniki enegije
    4. Praktični primeri
9. Tehnologije za shranjevanje in pretvorbo CO2.
    1. Energijski vektorji, ki temeljijo na pretvorbi CO2 (sintetični metan in sintetični metanol, sintetični ogljikovodiki)
    2. Analiza energijskih ravni, procesi sinteze energentov, katalitični procesi.
    3. Dimenzioniranje sistemov z ozirom na termodinamske parametre in kemijsko-fizikalno sestavo virov CO2.
    4. Energijska optimizacija tehnologij.
    5. Umeščanje tehnologij v obstoječe sisteme in ponovna uporaba produktov pretvorbe v energetskih sistemih.
10. Termična obdelava odpadnih snovnih tokov za namene energetske rabe
    1. Določitev termodinamskih parametrov, dimenzioniranje, zagotavljanje fleksibilnosti glede na vstopne materiale, postopki

5. Development, design and optimization of technologies for environmentally acceptable power generation in circular economy.

7. Design fundamentals of energy technologies in circular economy.
    1. Reaction pathway fundamentals for pyrolysis, gasification and plasma technologies.
    2. Fundamentals of energy carrier, fuel and basic chemical synthesis.
    3. Characterization of feedstock, selection of suitable conversion pathways.
    4. Waste stream valorisation.
8. Sector coupling
    1. Peak shaving and energy storage with low-carbon synthetic fuels.
    2. Hydrogen based energy carriers (for energy sector and transport) and their use as basic chemicals.
    3. Energy storage.
    4. Case studies.
9. Technologies for carbon capture and utilization.
    1. CO2 based synthetic energy carriers (methane, methanol, hydrocarbons).
    2. Energy balance analysis, synthesis pathways, catalytic processes.
    3. Design of conversion systems based on thermodynamic parameters and physical and chemical properties of CO2 sources.
    4. Energy optimization of conversion technologies.
    5. Positioning of technologies in existing energy systems, reuse of CO2 based energy carriers in existent infrastructure.
10. Thermal treatment of waste streams with energy recovery.
    1. Designing thermodynamic parameters, achieving flexibility according to input material

predpriprave vstopnih materialov
2. Energijska in masna bilanca, upravljanje stranskih produktov, predikcija koncentracij v plinastih produktih in trdnih snoveh
3. Izbira materialov za gradnjo sistemov
4. Izbira procesov za naknadno obdelavo stranskih produktov
5. Presoja vplivov na okolje

11. Termokemične tehnologije za pretvorbo odpadnih snovnih tokov.
    1. Izbira ustreznih procesov pretvorbe z ozirom na kemijsko-fizikalne lastnosti vstopnih materialov.
    2. Vodenje termičnega razpada.
    3. Entalpijske ravni procesov, snovna in energetska učinkovitost, izbira materialov za gradnjo.
    4. Pristopi dekontaminacije produktov naprednih termo-kemičnih tehnologij
12. Kemično recikliranje.
    1. Dimenzioniranje procesa, vodenje razklopa polimernih materialov, optimizacija snovnih in energijskih izkoristkov.
    2. Variacije termodinamskih parametrov z ozirom na kemijsko-fizikalne lastnosti vstopnih materialov.
    3. Optimizacija procesa z ozirom na lastnosti produktov.
    4. Karakterizacija produktov s poudarkom na energentih, izračuni končnih masnih in energijskih bilanc
13. Bio-osnovane tehnologije.
    1. Tehnologjie pridobivanja bioplina, biometana, izbor surovin, vodenje procesnih pogojev.
    2. Viri in tehnologije za predpripravo in izboljšanje kemijsko-fizikalnih lastnosti bio-olj.
    3. Postopki za neposredno uporabo

properties, feedstock pre-processing.
2. Energy and mass balance, management of side streams, prediction of pollutant concentrations and composition.
3. Selection of build materials.
4. Selection of flue gas and side stream aftertreatment systems.
5. Impact on environment.

11. Thermochemical technologies for conversion of waste streams.
    1. Selection of suitable thermochemical pathways according to physical and chemical properties of input materials.
    2. Controlling the process of thermal degradation.
    3. Enthalpy levels, material and energy efficiency, selection of build materials.
    4. Post processing of products.
12. Chemical recycling.
    1. Process design, control of depolymerization process, optimization of material and energy efficiency.
    2. Selection of thermodynamic parameters according to chemical and physical properties of input materials.
    3. Process optimization according to desired properties of output products.
    4. End product characterization with emphasis on energy carriers, final evaluation of mass and energy balance.
13. Bio-based technologies and utilization of bio-based products for energy use
    1. Technologies for production of biogas, selection of input materials, control of process parameters.
    2. Input materials and technologies for pre-treatment and improvement of chemical and physical properties of bio-oils.

tekočin in plinastih bio-osnovanih produktov v sistemih z visokim efektivnim izkoriskom. 14. Metode vrednotenja 1. Inventarji življenjskih ciklov za proizvode in procese – LCI 2. Indikatorji vrednot 3. Analize življenjskih ciklov (celostne masne, energijske in okoljske bilance) – LCA 4. Analize življenjskih stroškov – LCC 5. Vračilo energijskega vložka – EROI 15. Krožni energetski sistemi prihodnosti 1. Refleksija in povezovanje vsebin 2. Primeri dobrih praks iz izračuni in primerjalnimi analizami 3. Učinkoviti krožni energetski sistemi prihodnosti	3. Processes for direct use of liquid and gaseous bio-based products in systems with high effective efficiency. 14. Evaluation methods 1. Life cycle inventory for products and processes (LCI). 2. Value indicators. 3. Life cycle analysis (LCA), mass, energy and enviromental balances. 4. Life cycle cost analysis (LCC). 5. Energy return over energy invested (EROI). 15. Future energy systems. 1. Cross-linking of acquired knowledge within the subject. 2. Case studies, best practice examples with comparative analysis. 3. Efficient energy systems for circular economy.

Temeljna literatura in viri/Readings:

1. Hall, Charles A. S.: Energy return on investment : a unifying principle for biology, economics, and sustainability, Cham : Springer, cop. 2017, [COBISS.SI-ID 16292891]
2. Singh, Lakhveer: Waste to sustainable energy : MFCs – prospects through prognosis, CRC Press, Taylor & Francis, 2021, [COBISS.SI-ID 120066819]
3. Hauschild, Michael Z.: Life cycle assessment : theory and practice, Springer, cop. 2018, [COBISS.SI-ID 39782405]
4. A. Bejan, Entropy generation minimization : the method of thermodynamic optimization of finite-size systems and finite-time processes, CRC, 1996, ISBN - 0-8493-9651-4, [COBISS.SI-ID 1486619]
5. A. Bejan, Advanced engineering thermodynamics, J. Wiley & Sons, 2006, ISBN - 0-471-67763-9; 978-0-471-67763-5, [COBISS.SI-ID 9714459]

Cilji in kompetence:	**Objectives and competences:**
Cilji: 1. Uporabiti interdisciplinarna in transdisciplinarna znanja s področij tehnike, naravoslovja, okoljskih ved in ekonomije za kreiranje novih in inovativnih konceptov ravnanja s snovnimi in energijskimi tokovi 2. Razvoj in uporaba računalniško	Objectives: 1. Use of interdisciplinary and transdisciplinary engineering, natural sciences, environmental sciences and economics skills to create new and innovative concepts for material and energy flow management

podprtih metod za simulacijo in procesov, značilnih za krožno gospodarstvo 3. Uporaba metod za celostno vrednotenje produktov in procesov ter snovanje novih strategij pri prehodu na paradigmo krožnega gospodarstva. 4. Vzpostavljanje novih konceptov rabe energije s sektorskim povezovanjem in novimi poslovnimi modeli. 5. Spoznati metodolgijo in uporabo orodij za vrednotenje celovitih vplivov procesov za pretvorbo odpadnih snovnih tokov (termokemični in bio-osnovanih procesi). Kompetence: 1. Sposobnost povezovanja interdisciplinarnih in transdisciplinarnih znanj različnih področij strojništva, naravoslovja in ekonomije (S1-MAG + S7-MAG + S4-MAG + S10-MAG + P1-MAG + P2-MAG+ P3-MAG + P4-MAG + P6-MAG + + P7-MAG) 2. Sposobnost načrtovanja in celostne presoje produktov in procesov v krožnem gospodarstvu (S7-MAG + S10-MAG + P2-MAG + P4-MAG) 3. Sposobnost modeliranja in celostnega vrednotenja sodobnih energetskih rešitev, ki temeljijo na izrabi razpršenih OVE, sektorskega sklapljanja in pametnih omrežij (energetika, promet, industrija) (S1-MAG + S7-MAG + S4-MAG + S10-MAG + P1-MAG + P2-MAG+ P3-MAG + P4-MAG + P6-MAG + + P7-MAG) 4. Obvladanje optimizacije in izbire ustreznih termokemičnih in bio-osnovanih procesov glede na dano aplikacijo, vstopne surovine in želene končne produkte. (S1-MAG + S2-MAG + S8-MAG + S9-MAG + P1-MAG + P2-MAG + P3-MAG + P7-MAG)	2. Development and the use of computer-aided methods to simulate processes relevant to circular economy 3. Use of methods for holistic evaluation of products and processes and formulation of new strategies in the transition to the circular economy paradigm. 4. Establishing new energy use concepts through sector-coupling and new business models. 5. Obtain the knowledge on methods and tools for evaluation of overall impact of waste conversion processes. (thermochemical and bio-based processes). Competences: 1. Ability to integrate interdisciplinary and transdisciplinary skills in various fields of mechanical engineering, natural science and economics (S1-MAG + S7-MAG + S4-MAG + S10-MAG + P1-MAG + P2-MAG+ P3-MAG + P4-MAG + P6-MAG + + P7-MAG) 2. Ability to design and evaluate products and processes in a circular economy (S7-MAG + S10-MAG + P2-MAG + P4-MAG) 3. Ability to model and holistically evaluate modern energy solutions based on the use of disperse RES, sectoral coupling and smart grids (energy, transport, industry) (S1-MAG + S7-MAG + S4-MAG + S10-MAG + P1-MAG + P2-MAG+ P3-MAG + P4-MAG + P6-MAG + + P7-MAG) 4. Mastering optimization and selection of thermochemical and bio-based processes according to the required application, input materials and output products. (S1-MAG + S2-MAG + S8-MAG + S9-MAG + P1-MAG + P2-MAG + P3-MAG + P7-MAG)

Predvideni študijski rezultati:	Intended learning outcomes:
Znanja: Z2: Poglobljeno teoretično, metodološko in analitično znanje z elementi raziskovanja, ki je osnova za zelo zahtevno strokovno delo. Spretnosti: S2.1 Obvladovanje zelo zahtevnih, kompleksnih delovnih procesov in metodoloških orodij na specializiranih področjih. S2.2 Načrtovanje in vodenje delovnega procesa na podlagi ustvarjalnega reševanja problemov, povezanih s področjem izobraževanja in usposabljanja. S2.3 Sposobnost izvirnih dognanj/stvaritev in kritične refleksije.	Knowledge: Z2: Thorough theoretical, methodological and analyitical knowledge with elements of a research work that form a basis for very demanding professional work Skills: S2.1 Mastering very demending and complex work processes and methodological tools in specialised professional fileds. S2.2 Planning and managing of the working process on the basis of creative solving of problems that are linked to the teaching and training content. S2.3 Ability of unique innovations and critical reflections.

Metode poučevanja in učenja:	Learning and teaching methods:
Klasične oblike poučevanja: P1 Avditorna predavanja z reševanjem izbranih - za področje značilnih - teoretičnih in praktično uporabnih primerov. P2 Obravnava snovi po urejeni in vnaprej razloženi sistematiki. P3 Avditorne vaje, kjer se teoretično znanje s predavanj podkrepi z računskimi primeri. P4 Laboratorijske vaje z namenskimi didaktičnimi pripomočki (opišite katerimi- maks. dve vrstici na en pripomoček). P5 Uporaba študijskega gradiva v obliki tiskane in e-verzije predstavitve. **Moderne in prožne oblike poučevanja:** P7 Študij literature in razprava P8 Izdelava in predstavitev	**Conventional teaching methods:** P1 Auditorial lectures with solving selected field-specific theoretical and applied use cases. P2 Presenting the content according to the explained system. P3 Auditorial exrecises, in which theoretical content from the lectures is supplemented with practical examples. P4 Laboratory exercises with special-purpose didactic devices (description needs to be added, max. two lines per device). P5 Application of study material (description needs to be added, max. one line per material, e.g. textbook, e-book, printed lecture presentaions, etc.). **Contemporary and flexible teaching methods:**

aplikativnih seminarskih nalog P9 Skupinsko delo: strukturirana diskusija, projektno delo. P10: Uporaba anket v realnem času. P12 Individualizirane domače naloge v spletni učilnici P14 Virtualni eksperimenti P15 Uporaba video vsebin kot priprava na predavanja in vaje	P7 Literature study and discussion. P8 Making and presenting applied seminar exercises. P9 Team work: structured discussion, project work. P10: Use of real-time surveys P14 Virtual experiments. P15 Application of videos for preparations to the lectures and exercises.

Načini ocenjevanja:	**Delež/ Weight**	**Assessment:**
Teoretične vsebine (predavanja).	50,00 %	Theoretical contents (lectures).
Samostojno delo na vajah.	30,00 %	Coursework.
Delo na laboratorijskih vajah.	20,00 %	Laboratory exercises.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Mitja Mori:

1. **MORI, Mitja**, IRIBARREN, Diego, CREN, Julie, COR, Emmanuelle, LOTRIČ, Andrej, GRAMC, Jure, DROBNIČ, Boštjan, REY, Laurent, CAMPOS CARRIEDO, Felipe, PUIG-SAMPER, Gonzalo, BARGIACCHI, Eleonora, DUFOUR, Javier, STROPNIK, Rok. Life cycle sustainability assessment of a proton exchange membrane fuel cell technology for ecodesign purposes. International journal of hydrogen energy. [Online ed.]. 2023, vol. 48, iss. 99, str. 39673-39689, ilustr. ISSN 1879-3487. https://www.sciencedirect.com/science/article/pii/S0360319923026459, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=152816, DOI: 10.1016/j.ijhydene.2023.05.255. [COBISS.SI-ID 156527875]
2. STROPNIK, Rok, MLAKAR, Nejc, LOTRIČ, Andrej, SEKAVČNIK, Mihael, **MORI, Mitja**. The influence of degradation effects in proton exchange membrane fuel cells on life cycle assessment modelling and environmental impact indicators. International journal of hydrogen energy. [Print ed.]. 2022, vol. 47, iss. 57, str. 24223-24241, ilustr. ISSN 0360-3199. https://www.sciencedirect.com/science/article/pii/S0360319922014768, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=139081, DOI: 10.1016/j.ijhydene.2022.04.011. [COBISS.SI-ID 105811203]
3. LOTRIČ, Andrej, SEKAVČNIK, Mihael, KUŠTRIN, Igor, **MORI, Mitja**. Life-

cycle assessment of hydrogen technologies with the focus on EU critical raw materials and end-of-life strategies. International journal of hydrogen energy. [Print ed.]. Mar. 2021, vol. 46, iss. 16, str. 10143-10160, ilustr. ISSN 0360-3199. https://www.sciencedirect.com/science/article/pii/S0360319920323752, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=126296, DOI: 10.1016/j.ijhydene.2020.06.190. [COBISS.SI-ID 25340419]

4. **MORI, Mitja**, STROPNIK, Rok, SEKAVČNIK, Mihael, LOTRIČ, Andrej. Criticality and life-cycle assessment of materials used in fuel-cell and hydrogen technologies. Sustainability. Mar. 2021, vol. 13, iss. 6, str. 1-29, ilustr. ISSN 2071-1050. https://www.mdpi.com/2071-1050/13/6/3565, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=135056, DOI: 10.3390/su13063565. [COBISS.SI-ID 57362179]
5. STROPNIK, 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, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=125820, DOI: 10.1016/j.energy.2018.09.201. [COBISS.SI-ID 16276763]

Tomaž Katrašnik:

1. SELJAK, Tine, KATRAŠNIK, Tomaž. Designing the microturbine engine for waste-derived fuels. Waste management, ISSN 0956-053X. [Print ed.], Jan. 2016, vol. 47, pt. B, str. 299-310. [COBISS.SI-ID 14385691]
2. ŽNIDARČIČ, Anton, SELJAK, Tine, **KATRAŠNIK, Tomaž**. Surrogate model for improved simulations of small-scale sludge incineration plants. Fuel. [Print ed.]. Nov. 2020, vol. 280, str. 1-15, ilustr. ISSN 0016-2361. [COBISS.SI-ID 25534979]
3. ŽNIDARČIČ, Anton, **KATRAŠNIK, Tomaž**, ZSÉLY, I. G., NAGY, T., SELJAK, Tine. Sewage sludge combustion model with reduced chemical kinetics mechanisms. Energy conversion and management. [Print ed.]. May 2021, vol. 236, str. 1-15, ilustr. ISSN 0196-8904. [COBISS.SI-ID 58189827]
4. ŽVAR BAŠKOVIČ, Urban, VIHAR, Rok, SELJAK, Tine, **KATRAŠNIK, Tomaž**. Feasibility analysis of 100% tire pyrolysis oil in a common rail Diesel engine. Energy, ISSN 0360-5442. [Print ed.], Oct. 2017, vol. 137, str. 980-990. [COBISS.SI-ID 15305499]
5. MORI, Mitja, ŽVAR BAŠKOVIČ, Urban, STROPNIK, Rok, LOTRIČ, Andrej, **KATRAŠNIK, Tomaž**, ŠIPEC, Robert, LIPAR, Jakob, LESAR, Žiga, DROBNIČ, Boštjan. Green energy hubs for the military that can also support the civilian mobility sector with green hydrogen. International journal of hydrogen energy. [Online ed.]. May 2023, str. 1-16, ilustr. ISSN 1879-3487. [COBISS.SI-ID 153773315]

Tine Seljak:

1. GOH, Brandon Han Hoe, CHONG, Cheng Tung, ONG, Hwai Chyuan, **SELJAK, Tine**, KATRAŠNIK, Tomaž, JÓZSA, Viktor, NG, Jo-Han, TIAN, Bo, KARMARKAR, Srinibas, ASHOKKUMAR, Veeramuthu. Recent advancements in catalytic conversion pathways for synthetic jet fuel produced from bioresources. Energy conversion and management. [Print ed.]. Jan. 2022, vol. 251, str. 1-24, ilustr. ISSN 0196-8904. [COBISS.SI-ID 98610435]

2. FAUSSONE, Gian Claudio, **SELJAK, Tine**, JASIUKAITYTE, Edita, ŽVAR BAŠKOVIČ, Urban, KATRAŠNIK, Tomaž, GRILC, Miha, FAUSSONE, Gian Claudio. Pyrolysis oil from post-consumer packaging and its ageing : physical and chemical properties and drop-in performance in a power generating unit. Energy reports. Nov. 2023, vol. 10, str. 613-627, ilustr. ISSN 2352-4847. [COBISS.SI-ID 161718531]
3. **SELJAK, Tine**, BUFFI, Marco, VALERA-MEDINA, Augustin, CHONG, Cheng Tung, CHIARAMONTI, David, KATRAŠNIK, Tomaž. Bioliquids and their use in power generation : a technology review. Renewable & sustainable energy reviews : an international journal. [Print ed.]. Sep. 2020, vol. 129, str. 1-20, ilustr. ISSN 1364-0321. [COBISS.SI-ID 17774595]
4. ŽNIDARČIČ, Anton, KATRAŠNIK, Tomaž, ZSÉLY, I. G., NAGY, T., **SELJAK, Tine**. Sewage sludge combustion model with reduced chemical kinetics mechanisms. Energy conversion and management. [Print ed.]. May 2021, vol. 236, str. 1-15, ilustr. ISSN 0196-890 [COBISS.SI-ID 58189827]
5. KRAVOS, Andraž, **SELJAK, Tine**, RODMAN OPREŠNIK, Samuel, KATRAŠNIK, Tomaž. Operational stability of a spark ignition engine fuelled by low H2 content synthesis gas : thermodynamic analysis of combustion and pollutants formation. Fuel. [Print ed.]. Feb. 2020, vol. 261, str. 1-23, ilustr. ISSN 0016-2361. [COBISS.SI-ID 16879643]