PAMETNE TOVARNE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Pametne tovarne
Course title:	Smart factories
Članica nosilka/UL Member:	UL FS

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Strojništvo - Razvojno raziskovalni program, druga stopnja, magistrski	Proizvodno strojništvo (smer)	2. letnik	1. semester	obvezni

Univerzitetna koda predmeta/University course code:	0566844
Koda učne enote na članici/UL Member course code:	6053-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:	Marko Šimic, Miha Pipan, Niko Herakovič

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

Vrsta predmeta/Course	Obvezni strokovni predmet na smeri Proizvodno

type:	strojništvo, ki je izbirni strokovni predmet na ostalih smereh./Compulsory specialised course in the study of Production 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 v industrijo 4.0 - Značilnosti industrijskih revolucij - Orodja za povečanje konkurenčnosti tovarne - Industrijske in socialne spremembe ter spremembe kompetenc - Definicija pametne tovarne, stanje v svetu na področju pametnih tovarn 2. Opredelitev konceptov pametne tovarne - Digitalizacija in povezana veriga vrednosti - Gonila, omogočitelji in izzivi za I 4.0 - Značilnosti tradicionalne tovarne - Značilnosti pametne tovarne 3. Discipline, sistemi in tehnologije za I 4.0 - Omogočitvene tehnologije I 4.0 - Ključne tehnologije za pametno tovarno - Viri in podatki - Nove tehnologije - Umetna inteligenca 4. Ključni pristopi razvoja pametnih tovarn - Hierarhična struktura - Mrežna – distribuirana struktura - Internet stvari, Industrijski internet stvari in Internet storitev - Vertikalna integracija, horizontalna integracija	1. Introduction to Industry 4.0 - Characteristics of industrial revolutions - Tools for the increase of competitiveness of the factory - Industrial and social changes and competency changes - Definition of a smart factory, the global state of the art of smart factories 2. Definition of smart factory concepts - Digitalization and linked-up value chain - Drivers, enablers and challenges for I 4.0 - Features of a traditional factory - Features of a smart factory 3. Disciplines, systems and technologies for I 4.0 - Enabling technologies for I 4.0 - Key technologies for smart factories - Resources and data - New technologies - Artificial intelligence 4. Key approaches to smart factory development - Hierarchical structure - Network - distributed structure - Internet of Things, Industrial Internet of Things and Internet of Services - Vertical integration, horizontal integration

5. Ključni pristopi razvoja pametnih tovarn	5. Key approaches to smart factory development
- Pametna proizvodnja, sledljivost in povezljivost preko oblaka	- Smart production, traceability and connectivity across the cloud
- Pametna naprave – M2M komunikacija, pametni izdelki, pametna logistika materiala in informacij	- Smart devices - M2M communication, smart products, smart logistics of material and information
- Velepodatki in prediktivna analitika, dinamično planiranje	- Big data and predictive analytics, dynamic planning
6. Referenčni arhitekturni modeli pametne tovarne	6. Referential architectural models of smart factories
- RAMI 4.0, tri-dimenzijska struktura, značilnosti, povezljivost, prednosti in slabosti	- RAMI 4.0, three-dimensional structure, features, connectivity, strengths and weaknesses
- LASFA, dvo-dimenzijska struktura, transparentnost povezljivosti, prednosti	- LASFA, two-dimensional structure, transparency of connectivity, advantages
7. Koncepti pametne tovarne	7. Smart factory concepts
- Modularnost, povezljivost	- Modularity, connectivity
- Centralizirani, decentralizirani in distribuirani sistemi	- Centralized, decentralized and distributed systems
- Virtualizacija procesov in sistemov	- Virtualization of processes and systems
- Vizualizacija proizvodnega plana in aktivnosti	- Visualization of production plan and activities
- Usmerjenost na kupce in dobavitelje	- Focus on customers and suppliers
8. Koncept distribuiranih sistemov	8. The concept of distributed systems
- Distribuirani sistemi in njihove značilnosti	- Distributed systems and their characteristics
- Omogočitvene tehnologije distribuiranih sistemov	- Enabling technologies for distributed systems
- Povezljivost med objekti in subjekti	- Connectivity between objects and subjects
- Komunikacijski protokoli, delovanje v realnem času, fleksibilnost in agilnost	- Communication protocols, real-time operation, flexibility and agility
9. Top-down pristop pri uvajanju rešitev I 4.0	9. Top-down approach when implementing solutions of I 4.0
- Razvoj strategije	- Strategy development
- Implementacija strategije	- Implementation of the strategy
- Ovrednotenje strategije	- Evaluation of the strategy
- VDMA Toolbox – proizvodni procesi in izdelki	- VDMA Toolbox - manufacturing processes and products
10. Bottom-up pristop pri uvajanju rešitev I 4.0	10. Bottom-up approach in implementing solutions of I 4.0
- Sedem tipov potrat	- Seven types of waste
- Dodajaje vrednosti	- Adding value
- Pretočni čas, metoda VSM	- Flow time, VSM method
- Delovni cikel in balansiranje proizvodnega procesa	- Work cycle and the balancing of production process
- Modeliranje in simulacijski model procesa	- Modeling and a simulation model of a process
11. Koncept digitalnih dvojčkov (DD) proizvodnih procesov pametne tovarne	11. The concept of digital twins (DT) of
- Definicija, vrste in koncept DD	

	manufacturing processes of a smart factory
- Pomen DD	- Definition, types and a concept of DT
- Digitalni dvojček v življenjskem ciklu proizvodnega procesa	- The meaning of a DT
- Izzivi in implementacija v proizvodnem procesu - off-line in on-line simulacija	- Digital twin in the life cycle of the production process
12. Pet-dimenzionalno modeliranje DD in njegove ključne tehnologije	- Challenges and implementation in the production process - off-line and on-line simulation
- Tradicionalni tri-dimenzionalni digitalni dvojček	12. Five-dimensional modeling of a DT and its key technologies
- Razširjeni pet-dimenzionalni digitalni dvojček	- Traditional three-dimensional digital twin
- Ključne tehnologije za modeliranje DD	- Expanded five-dimensional digital twin
- Osem pravil modeliranja DD	- Key technologies for DT modeling
13. Krmiljenje pametne proizvodnje z digitalnim dvojčkom	- Eight DT modeling rules
- Koncept krmiljenja pametne proizvodnje z DD in ključne tehnologije, digitalni agenti	13. Control of a smart production with a digital twin
- Optimiranje porabe energije proizvodnih sredstev	- The concept of controlling smart manufacturing with a DT and key technologies, digital agents
- Kibernetsko-fizična spojitev v proizvodnji, krmiljeni z DD (fizični elementi, modeli, podatki, storitve)	- Optimization of energy consumption of means of production
- Prognostika delovanja pametne proizvodnje z DD	- Cyber-physical coupling in DT-controlled production (physical elements, models, data, services)
14. Digitalni dvojčki (DD) in nove tehnologije	- Prognostics of operation of smart production with DT
- Računanje v oblaku, „Edge computing"	14. Digital twins (DT) and new technologies
- DD in Velepodatki	- Cloud computing, "Edge computing"
- DD in storitve	- DT and Big Data
- DD in virtualna ter razširjena resničnost	- DT and services
- DD in kibernetsko-fizični sistemi	- DT and virtual and augmented reality
15. Pametna tovarna v produktronsko-preoblikovalnih procesih	- DT and cyber-physical systems
- Arhitekturni model pametne hidravlične stiskalnice, ki bo primerna za integracijo v pametno tovarno	15. A smart factory in productronic-transformation processes
- Pametne/inteligentne komponente hidravličnih in pnevmatičnih sistemov	- Architectural model of smart hydraulic press that will be suitable for integration into a smart factory
- Povezljivost in komunikacija med komponentami in podsistemi stiskalnice, pametna adaptivna orodja	- Smart/intelligent components of hydraulic and pneumatic systems
- Modeliranje in simulacija stiskalnice kot osnova za digitalnega dvojčka, arhitekturni model digitalnega dvojčka stiskalnice	- Connectivity and communication between components and subsystems of the press, smart adaptive tools
	- Modeling and simulation of a press as a basis for a digital twin, architectural model of a digital twin of the press

Temeljna literatura in viri/Readings:

1. Gao, Vincent: Smart manufacturing principles and applications, knjiga, [S. l.: V. Gao], cop. 2021, [COBISS.SI-ID 146626819].
2. Accialini, Nicola: Introduction to the smart factory: and practical tips for its implementation, neleposlovje za odrasle, [S. l.: N. Accialini], cop. 2021, [COBISS.SI-ID 146615043].
3. Groover, Mikell P.: Fundamentals of modern manufacturing: materials, processes, and systems, neleposlovje za odrasle, 7th ed., Hoboken (NJ) : John Wiley & Sons, cop. 2020, [COBISS.SI-ID 146641667].
4. Soloman, Sabrie: Sensors and control systems in manufacturing, priročnik, New York [etc.]: McGraw-Hill, 1994, [COBISS.SI-ID 843291].
5. Abdi, M. Reza: Integrated reconfigurable manufacturing systems and smart value chain: Sustainable infrastructure for the factory of the future, pregledna monografija; neleposlovje za odrasle, Springer, 2018, [COBISS.SI-ID 16110619].
6. Hopkinson, N.: Rapid manufacturing: an industrial revolution for the digital age, neleposlovje za odrasle, Chichester, England; Hoboken, NJ: John Wiley, cop. 2006, [COBISS.SI-ID 11614258].

Cilji in kompetence:	**Objectives and competences:**
Cilji:	Objectives:
1. Spoznati pomen, osnove in bistvo pametnih tovarn	1. To know the meaning, basics and essence of smart factories
2. Usvojiti osnovne koncepte in pristope pri koncipiranju pametnih tovarn	2. To gain basic concepts and approaches to design of smart factories
3. Spoznati ključne tehnologije I 4.0 in koncept distribuiranih sistemov	3. To learn about key technologies of I 4.0 and the concept of distributed systems
4. Usvojiti osnove izdelave digitalnih dvojčkov procesov v pametni tovarni na osnovi modeliranja diskretnih in delno zveznih dogodkov	4. To gain the basics of development of digital twins of processes in a smart factory based on the modeling of discrete and partially continuous events
5. Usvojiti osnove krmiljenja pametnih tovarn s pomočjo digitalnih dvojčkov in digitalnih agentov	5. To learn the basics of control of smart factories with the help of digital twins and digital agents
Kompetence:	Competencies:
1. Sposobnost ocene stopnje digitalizacije obstoječih tovarn	1. Ability to estimate the level of digitalization of existing factories
2. Razumevanje konceptov in pristopov pri koncipiranju novih pametnih tovarn ali pri transformaciji obstoječih tovarn v smeri pametne tovarne	2. Understanding the concepts and approaches to designing new smart factories or for transforming existing factories towards a smart factory
3. Razumeti ključne tehnologije I 4.0 in njihovo vlogo ter uporabnost v pametni tovarni	3. Understanding the key technologies of I 4.0 and their role and usefulness in a smart factory
4. Razumevanje in izdelava digitalnih dvojčkov procesov v pametni tovarni na osnovi diskretnih in delno zveznih dogodkov	4. Understanding and creation of digital twins of processes in a smart factory

5. Sposobnost uporabe digitalnih dvojčkov in digitalnih agentov pri krmiljenju pametne tovarne	based on discrete and partially continuous events 5. Ability to use digital twins and digital agents for control of a smart factory

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanja:	Knowledge:
Študent pozna in razume: vsebino in poslanstvo pametne tovarne v primerjavi s tradicionalnimi tovarnami. Pridobljena znanja uporabi študent za koncipiranje in načrtovanje procesov v pametnih tovarnah in njihovo povezovanje v celotni koncept pametne tovarne, za učinkovito uporabo tehnologij I 4.0 v pametni tovarni ter za izdelavo digitalnih dvojčkov procesov in celotne pametne tovarne, kakor tudi za krmiljenje celote.	The student knows and understands: the content and mission of a smart factory compared to traditional factories. The acquired knowledge is used by the student to draft and design processes in smart factories and to integrate them into the whole concept of a smart factory, to make effective use of I 4.0 technologies in a smart factory, and to produce digital twins of processes and the entire smart factory, as well as to control the whole system.
Spretnosti:	Skills:
1. Uporaba orodij za oceno stanja digitalizacije v tradicionalni tovarni 2. Uporaba računalniško podprtih orodij za koncipiranje učinkovite pametne tovarne za različne namene 3. Prepoznavanje uporabnosti tehnologij I 4.0 v pametni tovarni 4. Uporaba simulacijskih orodij za izdelavo digitalnega dvojčka pametne tovarne z različnimi podprocesi	1. The use of tools to evaluate the status of digitization of a traditional factory 2. The use of computer-aided tools for drafting an efficient smart factory for various purposes 3. The recognition of the usefulness of I 4.0 technologies in a smart factory 4. The use of simulation tools for building a digital twin of a smart factory with different subprocesses

Metode poučevanja in učenja:	**Learning and teaching methods:**
1. P1, P2 Avditorna predavanja podprta z interaktivnim prikazom praktičnih primerov 2. P3 Avditorne vaje z reševanjem praktičnih primerov 3. P4 Laboratorijske vaje s timskim reševanjem aplikativnih problemov in uporabo programske opreme ter njihova predstavitev z razpravo. 4. P5 Uporaba študijskega gradiva v e-obliki, skripta in e-verzija predavanj. 5. P6 Interaktivna predavanja 6. P7 Študij literature in razprava 7. P9 Skupinsko delo	1. P1, P2 Lectures supported by interactive presentation of practical examples 2. P3 Tutorials solving practical examples 3. P4 Laboratory exercises with team solving of application problems, using software and presenting them with discussion. 4. P5 Use of study material in e-form, lecture notes and e-version of lectures. 5. P6 Interactive lectures 6. P7 Literature review and discussion

	7. P9 Team work

Načini ocenjevanja:	Delež/ Weight	Assessment:
- Teoretične vsebine (predavanja, timsko delo): Kolokviji, prezentacija/zagovor timskega dela, pisni in/ali ustni izpit	50,00 %	- Theoretical contents (lectures, team work): Clloquium, team work presentation/defense, writing and/or oral exam
- Samostojno delo na avditornih in laboratorijskih vajah (vključno s poročili):	50,00 %	- Individual work in exercises, individual laboratory work (including reports):

Ocenjevalna lestvica: **Grading system:**

Reference nosilca/Lecturer's references:

Niko Herakovič:

1. **HERAKOVIČ, Niko**, ZUPAN, Hugo, PIPAN, Miha, PROTNER, Jernej, ŠIMIC, Marko. Distributed manufacturing systems with digital agents. Strojniški vestnik. Nov.-Dec. 2019, vol. 65, no. 11/12, str. 650-657, si 84, ilustr. ISSN 0039-2480, [COBISS.SI-ID 16942875], [JCR, SNIP, WoS, Scopus].
2. RESMAN, Matevž, PIPAN, Miha, ŠIMIC, Marko, **HERAKOVIČ, Niko**. A new architecture model for smart manufacturing: a performance analysis and comparison with the RAMI 4.0 reference model. Advances in production engineering & management. Jun. 2019, vol. 14, no. 2, str. 153-165, ilustr. ISSN 1854-6250. http://apem-journal.org/Archives/2019/APEM14-2_153-165.pdf, http://www.dlib.si/details/URN:NBN:SI:doc-W7XK1DPA, DOI: 10.14743/apem2019.318. [COBISS.SI-ID 16766235], [JCR, SNIP, WoS do 10. 8. 2023: št. citatov (TC): 31, čistih citatov (CI): 28, čistih citatov na avtorja (CIAu): 7.00, Scopus do 15. 10. 2023: št. citatov (TC): 45, čistih citatov (CI): 41, čistih citatov na avtorja (CIAu): 10.25].
3. ZUPAN, Hugo, **HERAKOVIČ, Niko**, STARBEK, Marko, KUŠAR, Janez. Hybrid algorithm based on priority rules for simulation of workshop production. International journal of simulation modelling, ISSN 1726-4529, Mar. 2016, vol. 15, nr. 1, str. 29-41, ilustr. http://www.ijsimm.com/Full_Papers/Fulltext2016/text15-1_29-41.pdf, http://www.ijsimm.com/Abstracts/Abstracts15-1.pdf, doi: 10.2507/IJSIMM15(1)319. [COBISS.SI-ID 14542875], [JCR, SNIP, WoS, Scopus].
4. DEBEVEC, Mihael, **HERAKOVIČ, Niko**. Digital twin of unique type of production for innovative training of production specialists. V: ZADNIK STIRN, Lidija (ur.), et al. SOR '19 proceedings. Ljubljana: Slovenian Society Informatika, Section for Operational Research, 2019. Str. 245-250, ilustr. ISBN 978-961-6165-55-6. [COBISS.SI-ID 16809499], [Scopus].
5. **HERAKOVIČ, Niko** (avtor, vodja projekta), ZUPAN, Hugo, DEBEVEC, Mihael, PIPAN, Miha. YER - smart factory proposal - i [sup] 3 approach : zaključno poročilo o rezultatih raziskovalno razvojnega dela. Ljubljana: Fakulteta za

strojništvo, Laboratorij LASIM, 2018. 12 f., ilustr. [COBISS.SI-ID 16026139].

Marko Šimic:

1. HERAKOVIČ, Niko, ZUPAN, Hugo, PIPAN, Miha, PROTNER, Jernej, **ŠIMIC, Marko**. Distributed manufacturing systems with digital agents. *Strojniški vestnik*. Nov./Dec. 2019, vol. 65, no. 11/12, str. 650-657, ilustr. ISSN 0039-2480. https://www.sv-jme.eu/sl/article/distributed-manufacturing-systems-with-digital-agents/, DOI: 10.5545/sv-jme.2019.6331. [COBISS.SI-ID 16942875], [JCR, SNIP].
2. RESMAN, Matevž, PIPAN, Miha, **ŠIMIC, Marko**, HERAKOVIČ, Niko. A new architecture model for smart manufacturing: a performance analysis and comparison with the RAMI 4.0 reference model. *Advances in production engineering & management*. Jun. 2019, vol. 14, no. 2, str. 153-165, ilustr. ISSN 1854-6250. http://apem-journal.org/Archives/2019/APEM14-2_153-165.pdf, DOI: 10.14743/apem2019.318. [COBISS.SI-ID 16766235], [JCR, SNIP, WoS].
3. RESMAN, Matevž, PROTNER, Jernej, **ŠIMIC, Marko**, HERAKOVIČ, Niko. A five-step approach to planning data-driven digital twins for discrete manufacturing systems. Applied sciences. Apr. 2021, vol. 11, iss. 8, str. 1-25, ilustr. ISSN 2076-3417. https://www.mdpi.com/2076-3417/11/8/3639, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=135308, DOI: 10.3390/app11083639. [COBISS.SI-ID 61630723].
4. DEBEVEC, Mihael, **ŠIMIC, Marko**, HERAKOVIČ, Niko. Digital factory to support deadlines prediction in small volume production. V: BERNARD, Alain (ur.). 10th IFAC Conference on Manufacturing Modelling, Management and Control MIM 2022 : Nantes, France, 22-24 June 2022. [S. l.]: Elsevier, 2022. Vol. 55, iss. 10, str. 2306-2311, ilustr. IFAC-PapersOnLine (Kidlington. Online), vol. 55, iss. 10. ISSN 2405-896 https://www.sciencedirect.com/science/article/pii/S2405896322020614, DOI: 10.1016/j.ifacol.2022.10.052. [COBISS.SI-ID 127758851].
5. DEBEVEC, Mihael, ZUPAN, Hugo, PIPAN, Miha, **ŠIMIC, Marko**, KOS, Andrej, ADROVIĆ, Edo, TURK, Maja, RESMAN, Matevž, HERAKOVIČ, Niko. *Študija proizvodnih zmogljivosti montažne linije malih robotov : razvito za podjetje YASKAWA Europe Robotics d.o.o.* Ljubljana: Fakulteta za strojništvo, Laboratorij za strego, montažo in pnevmatiko, 2017. 7 str., graf. prikazi. [COBISS.SI-ID 15546907].

Miha Pipan:

1. TURK, Maja, **PIPAN, Miha**, ŠIMIC, Marko, HERAKOVIČ, Niko. A smart algorithm for personalizing the workstation in the assembly process. Applied sciences. Dec. 2020, vol. 10, iss. 23, f. 1-19, ilustr. ISSN 2076-3417. https://www.mdpi.com/2076-3417/10/23/8624/htm, DOI: 10.3390/app10238624. [COBISS.SI-ID 40663299], [JCR, SNIP, WoS do 12. 2023: št. citatov (TC): 5, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 1,00, Scopus do 14. 2. 2023: št. citatov (TC): 5, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 1,00].
2. RESMAN, Matevž, **PIPAN, Miha**, ŠIMIC, Marko, HERAKOVIČ, Niko. A new architecture model for smart manufacturing : a performance analysis and comparison with the RAMI 4.0 reference model. *Advances in production engineering & management*. Jun. 2019, vol. 14, no. 2, str. 153-165, ilustr. ISSN

1854-6250. http://apem-journal.org/Archives/2019/APEM14-2_153-165.pdf, DOI: 10.14743/apem2019.318. [COBISS.SI-ID 16766235], [JCR, SNIP, WoS do 4. 1 2022: št. citatov (TC): 25, čistih citatov (CI): 22, čistih citatov na avtorja (CIAu): 5,50, Scopus do 14. 2023: št. citatov (TC): 35, čistih citatov (CI): 31, čistih citatov na avtorja (CIAu): 7,75].

3. HERAKOVIČ, Niko, ZUPAN, Hugo, **PIPAN, Miha**, PROTNER, Jernej, ŠIMIC, Marko. Distributed manufacturing systems with digital agents. *Strojniški vestnik*. Nov.-Dec. 2019, vol. 65, no. 11/12, str. 650-657, si 84, ilustr. ISSN 0039-2480. https://www.sv-jme.eu/sl/article/distributed-manufacturing-systems-with-digital-agents/, DOI: 10.5545/sv-jme.2019.6331. [COBISS.SI-ID 16942875], [JCR, SNIP, WoS do 24. 1. 2023: št. citatov (TC): 10, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 1,60, Scopus do 14. 2. 2023: št. citatov (TC): 10, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 1,60].

4. DEBEVEC, Mihael, ZUPAN, Hugo, **PIPAN, Miha**, ŠIMIC, Marko, KOS, Andrej, ADROVIĆ, Edo, TURK, Maja, RESMAN, Matevž, PROTNER, Jernej, HERAKOVIČ, Niko. *Modeliranje in simulacija ter optimizacija procesa varjenja, vključno z delovnimi mesti in tlorisom (razvito za podjetje Agromehanika d. d.) : poročilo o rezultatih raziskovalno razvojnega dela na projektu*. Ljubljana: Fakulteta za strojništvo, Laboratorij za strego, montažo in pnevmatiko, 2018. 38 str., ilustr. [COBISS.SI-ID 16236059].

5. **PIPAN, Miha**, PROTNER, Jernej, HERAKOVIČ, Niko. Distributed manufacturing node control with digital twin. V: ZADNIK STIRN, Lidija (ur.), et al. *SOR '19 proceedings*. Ljubljana: Slovenian Society Informatika, Section for Operational Research, 2019. Str. 257-262, ilustr. ISBN 978-961-6165-55-6. [COBISS.SI-ID 16810523], [Scopus].