UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Ime predmeta:	UPRAVLJANJE LOGISTIČNIH SISTEMOV
Course title:	CONTROL OF LOGISTICS SYSTEMS

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
LOGISTIKA SISTEMOV 3. stopnja		1.	1. in 2.
SYSTEM LOGISTICS 3rd degree		1.	1. in 2.

Vrsta predmeta (obvezni ali izbirni) /
Course type (compulsory or elective)

IZBIRNI
ELECTIVE

Univerzitetna koda predmeta / University course code:

DR

Predavanja Lectures	Seminar Seminar	Vaje Tutorial			Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
20		AV	LV	RV			160	6

Nosilec predmeta / Course coordinator:

DEJAN DRAGAN

Jeziki /Languages:

Predavanja / Lectures:	SLOVENSKI/SLOVENE
Vaje / Tutorial:	SLOVENSKI/SLOVENE

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

Ni pogojev.

Prerequisites for enrolling in the course or for performing study obligations:

None.

Vsebina (kratek pregled učnega načrta):

TEORIJA VODENJA SISTEMOV: Osnovni pojmi, modeli sistemov, deterministični in naključni sistemi, vodenje kot problem odločanja, optimalno vodenje na podlagi modela. Regulatorji naročil in sinhronizacija oskrbovalne verige za kompenzacijo učinka biča.

MODELIRANJE IN SIMULACIJA LOGISTIČNIH SISTEMOV: Teorija modeliranja diskretnih procesov, simulacijski jeziki, uvod v Scilab, simulacija diskretnih procesov, simulacija naključnih logističnih procesov, Monte Carlo simulacija.

UPORABA STATISTIČNIH MODELOV IN METOD PRI UPRAVLJANJU OSKRBOVALNIH VERIG, TRANSPORTU IN PROMETU:

Uporaba multivariantne statistične analize, strukturnih in drugih statističnih modelov v logistiki, oskrbovalnih verigah, transportu in prometu, za

Content (syllabus outline):

THEORY OF SYSTEM CONTROL: Ontology of system control, system models, deterministic and stochastic systems, control as decision making, optimal model-based control. Orders' Controllers and supply chain synchronization for the bullwhip effect compensation.

MODELING AND SIMULATION OF LOGISTIC SYSTEMS: Theory of discrete systems modelling, simulation tools, introduction to Scilab, simulation of discrete systems, simulation of stochastic logistic processes, Monte carlo simulation.

THE USE OF STATISTICAL MODELS AND METHODS FOR THE SUPPLY CHAIN MANAGEMENT, TRANSPORTATION AND TRAFFIC:

The use of multivariate statistical analysis, structural equation and other statistical models in logistics, supply chain management, transportation and

potrebe povečanja učinkovitosti podjetij in varnosti v transportu in prometu. Statistični modeli za ocenjevanje zmanjšanja emisij zaradi optimizacije v transportu.

METODE ZA UPRAVLJANJE Z LOGISTIČNIMI SISTEMI: Optimizacija transportnih in logističnih sistemov, razvrščanje opravil v logistiki, hevristični postopki in metahevristike pri optimizaciji logističnih sistemov, teorija napovedovanja časovnih vrst, postopki modeliranja in vodenja distribucijskih mrež.

PRIMERI UPRAVLJANJA LOGISTIČNIH SISTEMOV: Razporejanje distribucijskih centrov, primeri razvrščanja v logističnih sistemih, upravljanje zalog, napovedovanje povpraševanja po zalogah, modeliranje transporta v distribucijskih mrežah, optimizacija problemov množične strežbe.

traffic. The main emphasis is on increasing a companies' efficiency, as well as improving transportation and traffic safety.

METHODS FOR CONTROL OF LOGISTICS SYSTEMS: Optimization of transportation and logistics systems, job scheduling in logistic systems, heuristic procedures and meta-heuristics for the optimization of logistic systems, theory of time-series forecasting, modeling and control of distribution networks.

EXAMPLES OF LOGISTICS SYSTEMS CONTROL: Alocation of distribution centers, scheduling examples in logistic systems, inventory control, demand forecasting, modeling of transportation in distribution networks, optimization of the problems in the queueing theory.

Temeljni literatura in viri / Reading materials:

Ahuja, R.K.: Network flows : Theory, algorithms, and applications, Prentice Hall, 1993.

Axsäter, S.: Inventory Control. Boston: Kluwer Academic, 2000.

Box, Jenkins: Time Series Analysis: Forecasting and Control, Wiley, 4th edition, 2008.

Chase C.W. Demand-Driven Forecasting: A Structured Approach to Forecasting, Wiley, 2nd edition, 2013.

Dragan D., Upravljanje logističnih sistemov, Fakulteta za logistiko, 2009.

Dragan, D., Jereb, B. Introduction to queuing models : working report. Celje: Faculty of logistics, 2013.

Ghiani, G.: Introduction to Logistics Systems Planning and Control, John Wiley & Sons, 2004.

Gomez, C.: Engineering and Scientific Computing with Scilab, Springer, 2006.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. Multivariate Data Analysis (7th edition). New Jersey: Prentice Hall, 2007.

Hoyle, R. H. Handbook of Structural Equation Modeling. New York: The Guilford Press, 2012.

Hillier, F.S.: Introduction to Operations Research, McGraw-Hill, 2001.

Jesenko, J. & Jesenko. Multivariantne statistične metode. Kranj: Moderna organizacija, 2007.

Košmelj, B. Faktorska analiza. Ljubljana: Ekonomska fakulteta, 1986.

Law A.M.: Simulation Modelling and Analysis, McGraw-Hill Higher Education, 1999.

Muckstadt J., Sapra A.: Principles of Inventory Management: When You Are Down to Four, Order More, Springer, 2010.

Ross S.M.: Introduction to Probability Models, Academic Press, 1997.

Usenik, J.: Upravljanje logističnih sistemov, Biro 4D, Novo mesto, 2002.

Cilji in kompetence:

Študenti:
- spoznajo raziskovalno področje upravljanja logističnih sistemov in ga prepoznajo kot morebitno polje bodočega znanstvenega dela,
- pridobijo poglobljeno razumevanje modeliranja in simulacij logističnih sistemov in uporabe metod za njihovo upravljanje,
- se usposobijo učinkovito reševati zahtevnejše probleme na področju upravljanja logističnih sistemov,

Objectives and competences:

Students:
- are introduced to the research fields of logistics systems control, with possibility of adoption of the latter as the potencial field of research interest in the future,
- gain the deep understanding of logistics systems modeling, simulation and control,
- are qualified for efficient solving of more complicated problems in the field of logistics systems control,

| se usposobijo za samostojno znanstveno raziskovalno delo na tem področju, | are qualified for independent research and scientific work in this field, |
| se usposobijo za predstavitev svojega raziskovalnega dela (članki, referati). | are qualified for introduction of their scientific work by the means of publishing (articles, papers). |

Predvideni študijski rezultati:

Znanje in razumevanje:
Študent je ob koncu študija sposoben obvladati raziskovalne metode, postopke in procese na področju upravljanja logističnih sistemov.

Prenesljive/ključne spretnosti in drugi atributi:
Sposobnost za samostojno znanstveno raziskovalno delo na področju upravljanja logističnih sistemov. Sposobnost učinkovitega reševanja zahtevnejših problemov na tem področju. Razumevanje uporabe raziskovalnih metod z zmožnostjo poglobljene analize problemov in sistemskega razmišljanja na tem področju. Zmožnost ustvarjalnega sodelovanja pri reševanju težjih problemov v logististčnih okoljih.

Intended learning outcomes:

Knowledge and Understanding:
Graduated student is able to deal with research methods, procedures and processes in the field of logistics systems control.

Transferable/Key Skills and other attributes:
Capability of independent scientific and research work in the field of logistics systems control. Capability of efficient solving of more complicated problems in this field. Capability of dealing with research methods employment in this field, with the possibility of deep analysis and system reflection of the identified problems. Capability of creative collaboration in order to deal with solving of more difficult problems in logistics environments.

Metode poučevanja in učenja:

Pri predavanjih študent spozna teoretične vsebine predmeta, nato študent utrdi teoretično znanje in preko primerov pridobi razumevanje za reševanje zahtevnejših aplikativnih problemov.

Learning and teaching methods:

Lectures: Student is introduced to the theoretical part of the subject. Student is pointed to consolidate the theoretical part of the subject. Additionally, student is pointed to gain the understanding for the solving of more demanding application problems.

Načini ocenjevanja:	Delež (v %) / Share (in %)	**Assessment methods:**
Projekt (raziskovalna naloga).	70%	Project (research work).
Ustni izpit.	30%	Oral examination.

Reference nosilca / Course coordinator's references:

1. Marko Intihar, Tomaž Kramberger, Dejan Dragan. Container Throughput Forecasting Using Dynamic Factor Analysis and ARIMAX Model. Promet, ISSN 0353-5320. [Print ed.], 2017, vol. 29, no. 5, str. 529-542. [JCR, SNIP, WoS]. doi: 10.7307/ptt.v29i5.2334.
2. TOPOLŠEK, Darja, DRAGAN, Dejan. Relationships between the motorcyclists' behavioural perception and their actual behaviour. *Transport*, ISSN 1648-3480. [Online ed.]. http://www.tandfonline.com/doi/abs/10.3846/16484142.2016.1141371, doi: 10.3846/16484142.2016.1141371. [COBISS.SI-ID 512755261], [JCR, SNIP, Scopus do 31. 8. 2017: št. citatov (TC): 1, čistih citatov (CI): 1].
3. TOPOLŠEK, Darja, DRAGAN, Dejan. Behavioural comparison of driverswhen driving a motorcycle or a car : a structural equation modelling study. *Promet*, ISSN 0353-5320. [Print ed.], 2015, vol. 27, no. 6, str. 457-466, ilustr.http://www.fpz.unizg.hr/traffic/index.php/PROMTT/issue/view/163. [COBISS.SI-ID 512739133], [JCR, SNIP, WoS do 13. 2. 2016: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 20. 1. 2016: št. citatov (TC): 0, čistih citatov (CI): 0].
4. KRAMBERGER, Tomaž, DRAGAN, Dejan, PRAH, Klemen. A heuristic approach to reduce carbon dioxide emissions. *Proceedings of the Institution of Civil Engineers - Transport*, ISSN 0965-092X. [Print ed.], Okt. 2014,

vol. 167, iss. 5, str. 296-305.http://www.icevirtuallibrary.com/content/article/10.1680/tran.11.00053, doi: 10.1680/tran.11.00053. [COBISS.SI-ID 512554557], [JCR, SNIP, WoS do 12. 1. 2015: št. citatov (TC): 1, čistih citatov (CI): 1, Scopus do 27. 9. 2017: št. citatov (TC): 2, čistih citatov (CI): 2].

5. DRAGAN, Dejan, VIZINGER, Tea, INTIHAR, Marko, KRAMBERGER, Tomaž, FOŠNER, Maja, PRAH, Klemen. Reconstruction of delivery positions in the city of Celje, Slovenia. *Transport problems : international scientific journal*, ISSN 1896-0596. [Printed ed.], 2013, vol. 8, iss. 2, str. 11-24. http://www.transportproblems.polsl.pl/pl/Archiwum/2013/zeszyt2/2013t8z2_02.pdf. [COBISS.SI-ID 512516157], [SNIP, Scopus do 17. 8. 2013: št. citatov (TC): 0, čistih citatov (CI): 0].

6. DRAGAN, Dejan, KRAMBERGER, Tomaž, LIPIČNIK, Martin. Monte Carlo simulation-based approach to optimal bus stops allocation in the Municipality of Laško. *Promet*, ISSN 0353-5320. [Print ed.], 2011, vol. 23, no. 4, str. 265-278. [COBISS.SI-ID 512342333], [JCR, SNIP, WoS do 5. 2. 2015: št. citatov (TC): 1, čistih citatov (CI): 0, Scopus do 31. 8. 2017: št. citatov (TC): 3, čistih citatov (CI): 3].

7. DRAGAN, Dejan. Fault detection of an industrial heat-exchanger : a model-based approach. *Strojniški vestnik*, ISSN 0039-2480, jun. 2011, vol. 57, no. 6, str. 477-484, ilustr., doi: 10.5545/sv-jme. 2010.128. [COBISS.SI-ID 512232253], [JCR, SNIP, WoS do 6. 7. 2016: št. citatov (TC): 4, čistih citatov (CI): 4, Scopus do 25. 11. 2016: št. citatov (TC): 7, čistih citatov (CI): 7].

8. DRAGAN, Dejan, KRAMBERGER, Tomaž, TOPOLŠEK, Darja. Efficiency and travel agencies : Bayesian structural equation model. V: KRAMBERGER, Tomaž (ur.), POTOČAN, Vojko (ur.), IPAVEC, Vesna Mia (ur.). *Sustainable logistics and strategic transportation planning*, (Advances in logistics, operations, and management science book series (Print), ISSN 2327-350X). Hershey: IGI Global. cop. 2016, str. 211-235, ilustr. http://www.igi-global.com/book/sustainable-logistics-strategic-transportation-planning/141939, doi: 10.4018/978-1-5225-0001-8.ch010. [COBISS.SI-ID 512762173].

9. DRAGAN, Dejan, KRAMBERGER, Tomaž, PRAH, Klemen. Transport optimization and estimation of reduced CO2 emissions. V: KRAMBERGER, Tomaž (ur.), POTOČAN, Vojko (ur.), IPAVEC, Vesna Mia (ur.). *Sustainable logistics and strategic transportation planning*, (Advances in logistics, operations, and management science book series (Print), ISSN 2327-350X). Hershey: IGI Global. cop. 2016, str. 405-436, ilustr. http://www.igi-global.com/book/sustainable-logistics-strategic-transportation-planning/141939, doi: 10.4018/978-1-5225-0001-8.ch019. [COBISS.SI-ID 512762429].

10. DOLENC, Boštjan, BOŠKOSKI, Pavle, STEPANČIČ, Martin, POHJORANTA, Antti, JURIČIĆ, Đani. State of health estimation and remaining useful life prediction of solid oxide fuel cell stack. *Energy conversion and management*, ISSN 0196-8904. [Print ed.], 2017, vol. 148, str. 993-1002, doi: 10.1016/j.enconman.2017.06.041. [COBISS.SI-ID 30661927]

11. DOLENC, Boštjan, VREČKO, Darko, JURIČIĆ, Đani, POHJORANTA, Antti, PIANESE, Cesare. Online gas composition estimation in solid oxide fuel cell systems with anode off-gas recycle configuration. *Journal of power sources*, ISSN 0378-7753, 2017, vol. 343, str. 246-253, doi:10.1016/j.jpowsour.2017.01.038. [COBISS.SI-ID 30189095].

12. BRADEŠKO, Andraž, JURIČIĆ, Đani, SANTO-ZARNIK, Marina, MALIČ, Barbara, KUTNJAK, Zdravko, ROJAC, Tadej. Coupling of the electrocaloric and electromechanical effects for solid-state refrigeration. *Applied physics letters*, ISSN 0003-6951. [Print ed.], 2016, vol. 109, no. 14, str. 143508-1-143508-7, doi: 10.1063/1.4964124. [COBISS.SI-ID 29824039].

13. GLAVAN, Miha, GRADIŠAR, Dejan, INVITTO, Serena, HUMAR, Iztok, JURIČIĆ, Đani, PIANESE, Cesare, VRANČIĆ, Damir. Cost optimisation of supermarket refrigeration system with hybrid model. *Applied thermal engineering*, ISSN 1359-4311. [Print ed.], 2016, vol. 103, str. 56-66, doi: 10.1016/j.applthermaleng.2016.03.177. [COBISS.SI-ID 29455655].

14. NERAT, Marko, JURIČIĆ, Đani. A comprehensive 3-D modeling of a single planar solid oxide fuel cell. *International journal of hydrogen energy*, ISSN 0360-3199. [Print ed.], 2016, vol. 41, no. 5, str. 3613-2627, doi: 10.1016/j.ijhydene.2015.11.136. [COBISS.SI-ID 29281319].

15. DOLENC, Boštjan, VREČKO, Darko, JURIČIĆ, Đani, POHJORANTA, Antti, PIANESE, Cesare. Online estimation of internal stack temperatures in solid oxide fuel cell power generating units. *Journal of power sources*, ISSN 0378-7753, 2016, vol. 336, str. 251-260, doi: 10.1016/j.jpowsour.2016.10.070. [COBISS.SI-ID 29917735].

16. DOLENC, Boštjan, BOŠKOSKI, Pavle, JURIČIĆ, Đani. Distributed bearing fault diagnosis based on vibration analysis. *Mechanical systems and signal processing : MSSP*, ISSN 0888-3270. [Tiskana izd.], 2016, vol. 66/67, str. 521-532, doi: 10.1016/j.ymssp.2015.06.007. [COBISS.SI-ID28704551].

17. BOŠKOSKI, Pavle, JURIČIĆ, Đani. Inverse Gaussian mixtures models of bearing vibrations under local faults. *Mechanical systems and signal processing : MSSP*, ISSN 0888-3270. [Tiskana izd.], 2016, vol. 66/67, str. 546-556, doi: 10.1016/j.ymssp.2015.05.010. [COBISS.SI-ID28647207].