UČNI NAČRT PREDMETA/COURSE SYLLABUS	
Predmet:	SKLADIŠČNA TEHNIKA IN TEHNOLOGIJA
Course title:	WAREHOSE TECHNICS AND TECHNOLOGY

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
GOSPODARSKA IN TEHNIŠKA LOGISTIKA 1.stopnja		2.	4.
PROFESSIONAL HIGHER EDUCATION STUDY PROGRAMME ECONOMIC AND TECHNICAL LOGISTICS 1st degree		2.	4.

Vrsta predmeta / Course type	OBVEZNI

Univerzitetna koda predmeta / University course code:	VS

Predavanja Lectures	Seminar Seminar	vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
15 e-P 45 a-P		15 a-V 9 e-V	6		90	6

Nosilec predmeta / Lecturer:	TONE LERHER

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisits:
Ni pogojev.	None.

Vsebina:	Content (Syllabus outline):
Tok materiala (tekočinski model toka materiala, skladišče kot sistem čakalne vrste). Zagotavljanje optimalnega toka materiala in informacijskega toka s pomočjo skladiščnih in transportno manipulativnih sredstev. Razvoj in pomen skladiščnih in transportno manipulativnih sredstev. Razdelitev in upravljanje glavnih skladiščnih procesov: sprejem, uskladiščenje, komisioniranje, pakiranje, odprema in distribucija blaga. Tehnologije skladiščnih sistemov (talno odlaganje blaga, regalna-, pretočna-, mobilna skladišča, "Drive-in" in "Drive-through" pretočna skladišča, "Crossdocking"). Transportna in manipulativna oprema (naprave za zvezno in ciklično delovanje, avtomatizacija skladiščnih, transportnih in manipulativnih sredstev). Skladiščne strategije kot podpora skladiščnim procesom (sistem za upravljanje in naročanje transporta, vpeljava ABC sistema pri uskladiščenju blaga, postopek komisioniranja "Pick by light" in "Pick by voice", optimiranje poti komisionarja, sledenje blaga "Fleet manager"). Oblikovanje in optimiranje skladišč. Vzdrževanje skladiščnih, transportnih in manipulativnih sredstev. Značilnosti in uporaba paletizacije (euro-paleta, zaboji, kontejnerji).	Materials flow (liquid model of material flow, warehouse as a queue system). Assuring the optimal material flow and informational flow with the help of warehousing and transport handling devices. The development and the meaning of warehousing and transport handling devices. The classification and managing of the main warehousing processes: receiving, storage, order picking, retrieval and distribution of goods. Technology of warehousing systems (block stacking, rack storage, flow rack, mobile rack, Drive-in, Drive-through, flow rack with satellite vehicle, Cross docking). Transport and handling equipment (devices for the continuous and discrete operation, automation of warehousing AS/RS, transport and handling devices). Warehouse strategies as a support to the warehousing processes (the system for managing-ordering of transport, the application of ABC system with the storage of goods, the order picking process "Pick by light", "Pick by voice", the order picker root optimization "S shape heuristics, optimal heuristics", the goods tracking "Fleet manager"). Designing and optimizing warehouses. Maintenance of the warehousing, transport and manipulation devices.

Pomen embalaže v integralnem transportu. Sistem oskrbnih verig in varovanje tovora pri skladiščenju, notranjem transportu in manipulaciji blaga. Stroški pri skladiščenju, transportu in manipulaciji blaga. Logistični servis "outsourcing". Skladiščno upravljavski sistem, informacijska podpora sistemom in skladiščnim procesom (standard GS1, SSCC, EAN koda, RFID tehnologija).	The characteristics and the application of pallets (euro-pallet, boxes, containers). The importance of packaging in the integral transport. The system of supply chain management and the protection of the shipment for the warehousing, internal transport and goods manipulation. The cost of warehousing, internal transport and goods manipulation. Logistics service "outsourcing". Warehouse management system, informational support of systems in the warehousing processes (standard GS1, SSCC, EAN code, FFID technology).

Temeljni literatura in viri / Readings:

- E-gradivo predmeta.
- Lerher, T., Potrč, I. (2017) Transportni sistemi v intralogistiki. Univerza v Mariboru, Fakulteta za logistiko.
- Bartholdi, John J. & Hackman, Steven T. (2017). Warehouse and distribution science, Release 0.98. The Supply Chain & Logistics Institute, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology Atlanta, USA.
- Kay B.M. (2016) Lecture Notes for Production system design, North Carolina State University, USA.
- Gudehus, T. (2012) Logistik 1: Grundlagen, Verfahren und Strategien, Springer Verlag, Berlin.
- Arnold, D. (2002) Handbuch Logistik, Berlin, Springer Verlag, ISBN: 3-540-41996-9, COBISS.SI-ID: 24234757.

Cilji in kompetence:

Objectives and competences:

- se seznanijo s skladiščnimi poslovanjem v različno organiziranih skladiščnih sistemih, - se usposobijo izdelati načrt organizacije poslovanja skladiščnega sistema, - razviti sposobnosti študentov za samostojno in kreativno reševanje problemov dimenzioniranja skladiščnih sistemov.	- to introduce special knowledge for operation of different organized warehouses, - to get knowledge for organisation design and operating rules for the warehousing system, - to further develop student's capabilities of independent and creative solutions of dimensioning the warehouse systems.

Predvideni študijski rezultati:

Intended learning outcomes:

- povezovati uporabo različnih znanj za reševanje problemov skladiščenja in izbire opreme, - aplikacija algoritmov optimiranja skladiščnih sistemov na realne probleme skladiščenja, - poznavanje pojma tehniške logistike, - poznavanje osnovnih konceptov logistične verige, principov delovanja sistemov transporta, projektnih zahtev in sledenje tovora v logističnem sistemu, - povezovanje različnih znanj in postopkov ter pomena uporabe strokovne literature in računalniških sistemov za reševanje logističnih problemov.	- combined use of different fundamental skills for solution of warehousing and equipment selection, - application of algorithms for storage systems optimization applied on real practical problems, - knowledge of technical logistics conception, - knowledge of fundamental principles of logistics – supply chain, operation principles of transport systems, projects demands and tracking the freight in the logistics system, - connection of different knowledge and procedures and importance of professional literature and computer systems for efficient solutions of logistics problems.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja: pri predavanjih študent spozna teoretične vsebine predmeta. Del predavanj se izvaja na klasični način v predavalnici, del pa v obliki e-predavanj (e-predavanja se lahko izvajajo na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju). Vaje: pri vajah študent utrdi teoretično znanje in spozna	Lectures: students understand the theoretical frameworks of the course. Part of the lecture course is in a classroom while the rest is in the form of e-learning (e-lectures may be given via video-conferencing or with the help of specially designed e-material in a virtual electronic learning environment). Tutorials: Students enhance their theoretical knowledge

| | aplikativne možnosti. Del vaj se izvaja na klasični način v predavalnici, del pa v obliki e-vaj (e-vaje se lahko izvajajo na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju). | and are able to apply it. Part of the seminar is in a classroom while the rest is in the form of e-learning (e-tutorials may be given via video-conferencing or with the help of specially designed e-material in a virtual electronic learning environment). |

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
▪ Opravljene obveznosti e-predavanj in e-vaj so pogoj za pristop k izpitu.		▪ Successful completion of e-lectures and e-tutorials is a prerequisite for entering the exam.
▪ Pisni izpit.	50%	▪ Written exam.
▪ Ustni izpit.	50%	▪ Oral exam.

Reference nosilca / Lecturer's references:

1. Lerher, T., Borovinšek, M., Ficko, M., Palčič, I. (2017). Parametric study of throughput performance in SBS/RS based on simulation. International journal of simulation modelling, Vol. 16, No. 1, 96-107, doi: 10.2507/IJSIMM16(1)8.372.
2. Lerher, T., Ekren, B. Y., Sari, Z., Rosi. B. (2016). Method for evaluating the throughput performance of shuttle based storage and retrieval systems. Technical Gazette, Vol. 23, No. 3, 715-723.
3. Lerher, T., Ekren, B. Y., Sari, Z., Rosi. B. (2015). Simulation Analysis of Shuttle Based Storage and Retrieval Systems. International Journal of Simulation Modelling, Vol. 14, No. 1, 48-59. doi: 10.2507/IJSIMM14(1)5.281.
4. LERHER, Tone, EDL, Milan, ROSI, Bojan. Energy efficiency model for the mini-load automated storage and retrieval systems. Int. j. adv. manuf. technol., August 2013, doi: 10.1007/s00170-013-5253-x.
5. LERHER, Tone, ŠRAML, Matjaž, POTRČ, Iztok. Simulation analysis of mini-load multi-shuttle automated storage and retrieval systems. Int. j. adv. manuf. technol., 2011, vol. 54, no. 1/4, str. 337-348, doi: 10.1007/s00170-010-2916-8.
6. LERHER, Tone, POTRČ, Iztok, ŠRAML, Matjaž, TOLLAZZI, Tomaž. Travel time models for automated warehouses with aisle transferring storage and retrieval machine. Eur. J. oper. res.. [Print ed.], Sep. 2010, vol. 205, iss. 3, str. 571-583, doi: 10.1016/j.ejor.2010.01.025.
7. LERHER, Tone, ŠRAML, Matjaž, POTRČ, Iztok, TOLLAZZI, Tomaž. Travel time models for double-deep automated storage and retrieval systems. Int. J. Prod. Res., June 2010, vol. 48, no. 11, str. 3151-3172, doi: 10.1080/00207540902796008.