

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Predmet:	PRINCIPI SKLADIŠČENJA IN EMBALIRANJA
Course title:	PRINCIPLES OF WAREHOUSING AND PACKAGING

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
LOGISTIKA SISTEMOV 2.stopnja		2.	3.
SYSTEM LOGISTICS 2.degree		2.	3.

Vrsta predmeta / Course type: IZBIRNI

Univerzitetna koda predmeta / University course code: MAG 13

klinične vaje

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
5 e-P 40 a-P		15 e-V 25 a-V			65	5

Nosilec predmeta / Lecturer: IZTOK POTRČ

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

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

Prerequisites:

Ni pogojev.

None

Vsebina:

Content (Syllabus outline):

**Predavanja:**

1. Uvodno poglavje – razvoj in pomen skladiščnih sistemov v transportno-skladiščni logistični funkciji.
2. Materialni tok – skladišče kot sistem čakalne vrste ("tekočinski model").
3. Operacije skladiščenja – sprejem, naročila, komisioniranje, kontrola, pakiranje, odprema.
4. Upravljanje skladiščnih sistemov – sprejem in odprema, zaloge, lastnosti, oskrba trga.
5. Skladiščna in manipulativna oprema – oprema za uskladiščenje, transporterji, sortirna oprema.
6. Vrste viličarjev – glede na principe delovanja, pogone, zmogljivosti, nosilnosti.
7. Transportni vozički – klasični, avtonomni, zložljivi, montažni – namenski vozički, induktivno vodeni itd.

**Lectures:**

1. Introduction – importance of warehouse systems in the transport-warehouse logistics function.
2. Material flow – warehouse as a queuing system ("fluid flow model").
3. Warehouse operations – receiving, process customer orders, order-picking, checking, packing, put away.
4. Warehouse management systems – receiving and shipping, stock locator system, features, market supply.
5. Storage and handling equipment – storage equipment, transporters, sorting equipment etc.
6. Types of forklifts – due to their working principles, drive motors, carrying capacity, bearing strength.
7. Transportation handcarts – classical, autonomous, folding, assembling – special handcarts, inductive guided

8. Transportno skladiščne enote – palete, zaboji.
9. Oblikovanje in načrtovanje embalaže.
10. Tehnološki postopki pakiranja: vakumsko pakiranje, sterilno pakiranje, pakiranje v modificirani atmosferi, aktivno pakiranje.
11. Varovanje tovora in varno manipuliranje – pri notranjem transportu, pri transport na daljše razdalje, varno upravljanje s transportnimi sredstvi.
12. Skladiščne strategije.
13. Komisioniranje – načini, sredstva, cone.
14. Oblikovanje skladiščnih sistemov – regalni skladiščni sistemi, konstrukcija skladišč, optimiranje oblike.

Seminar:

Seminar aplikativno dopolnjujejo vsebino predavanj s praktičnim reševanjem problemov skladiščnih sistemov.

etc.

8. Transport storage unit – pallets, boxes etc.
9. Designing and planning of packing.
10. Technological procedures of packing: vakuum packing, sterile packing, packing in a modified atmosphere, active packing.
11. Protection of goods and safety manipulating – at interior transport, at transport on long distance, safety managing with transport devices.
12. Storage strategies.
13. Commissionaire – types, equipment, zones.
14. Design of warehouse systems – storage rack systems, construction of the warehouse, shape optimisation.

Seminar:

Seminar (project) work supplement lectures with practical solutions of engineering problems concerning warehouse operations.

Temeljna literatura in viri / Readings:

- Bartholdi J.J., Hackman S.T. Warehouse and distribution science, V3.0, (<http://www.warehouse-science.com>, 2003.
- Pfohl H.C. Logistiksysteme: betriebswirtschaftliche Grundlagen, Springer Verlag, Berlin 2004.
- Krampe H., Lucke H.J. Grundlagen der Logistik: Theorie und Praxis logistischer SystemHusverlag, München 2006.
- Langelage M. Fit im Lager, HussVerlag, München, 2006.
- Product Section of the Material Handling Industry. Consideration for Planning an Automated Storage/Retrieval System. 1999, (<http://www.mhia.org/ASRS>).
- Schlobohm W. Dolezych – einfach sicher: Ladungssicherung – aber richtig, 2003.
- Köttgen Lagertechnik GmbH & Co. KG (<http://www.koettgen-lagertechnik.de/>), 2005.
- Viastore Systems GmbH&Co (<http://www.viastore.de/>), 2005.
- Paine, F.,A.: Handbook of food packaging, London, Blackie Academic & Professional, 1992, ISBN: 0-216-93210-6, COBISS.SI-ID: 13417733.

Cilji in kompetence:

- podati poglobljeno znanje s področja teorije, uporabe in pomena transportnih sistemov v kompleksnem logističnem procesu,
- prikazati praktično uporabo predhodno pridobljenih osnovnih znanj iz matematike, diskretnih metod, mehanike in transportne tehnike,
- razviti sposobnosti študentov za samostojno in kreativno reševanje problemov izbire in uporabe transportnih naprav v logističnem sistemu.

Objectives and competences:

- to provide detailed knowledge of basic theory, functional use and importance of transport systems in the complex logistics process,
- to demonstrate practical use of previously accumulated skills of mathematics, mechanics and transport technique,
- to further develop student's capabilities of independent and creative solutions for transportation devices at logistics system.

Predvideni študijski rezultati:

Znanje in razumevanje:

- poznavanje pojma tehniške logistike,
- poznavanje osnovnih konceptov logistične verige, principov delovanja sistemov transporta, projektnih zahtev in sledenje tovora v logističnem sistemu,

Intended learning outcomes:

Knowledge and understanding:

- 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,

- povezovanje različnih znanj in postopkov ter pomena uporabe strokovne literature in računalniških sistemov za reševanje logističnih problemov.

Prenesljive/ključne spretnosti in drugi atributi:

- povezovati uporabo različnih znanj za reševanje problemov logistike pri transportnih sistemih,
- osnove izbire in projektiranja transportnih naprav v logističnem sistemu.

- connection of different knowledge and procedures and importance of professional literature and computer systems for efficient solutions of logistics problems.

Transferable/Key skills and other attributes:

- combined use of different fundamental skills for solution of internal transport logistics problems,
- fundamentals of selection and projecting of transport devices at logistics system.

Metode poučevanja in učenja:

- 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 aplikativne možnosti. Del vaj se izvaja na klasični način v predavalnici, del pa v obliki e-predavanj (e-vaje se lahko izvajajo na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju).

Learning and teaching methods:

- 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)
- Seminars: Students enhance their theoretical knowledge 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-seminars 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:
<ul style="list-style-type: none"> <li>• opravljene domače in projektna naloga,</li> <li>• ustni izpit (teoretično in praktično znanje).</li> </ul>	<p>50</p> <p>50</p>	<ul style="list-style-type: none"> <li>• completed home-works and seminar (project) work,</li> <li>• oral examination (theoretical and practical knowledge).</li> </ul>

Reference nosilca / Lecturer's references:

1. REIBENSCHUH, Marko, ODER, Grega, ČUŠ, Franc, POTRČ, Iztok. Modelling and analysis of thermal and stress loads in train disc brakes - braking from 250 km/h to standstill. *Stroj. vestn.*, 2009, vol. 55, no. 7/8, str. 494-502, ilustr. [http://www.sv-jme.eu/scripts/download.php?file=/data/upload/2009/SV-7-8-09/8 Odar zi p494 502.pdf](http://www.sv-jme.eu/scripts/download.php?file=/data/upload/2009/SV-7-8-09/8%20Odar%20zi%20p494%20502.pdf).
2. HREN, Gorazd, POTRČ, Iztok, AVSEC, Jurij. Integrated web-based framework for product mechanism simulation. *Advanced engineering*, 2010, year 4, no. 1, str. 25-36, ilustr.
3. 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](https://doi.org/10.1016/j.ejor.2010.01.025).
4. 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](https://doi.org/10.1080/00207540902796008).
5. LERHER, Tone, ŠRAML, Matjaž, POTRČ, Iztok. Simulation analysis of mini-load multi-shuttle automated storage and retrieval systems. *Int. j. adv. manuf. technol.*, Published online: 14 September 2010, doi: [10.1007/s00170-010-2916-8](https://doi.org/10.1007/s00170-010-2916-8).
6. ŠAMEC, Blaž, POTRČ, Iztok, ŠRAML, Matjaž. Low cycle fatigue of nodular cast iron used for railway brake discs. *Eng fail. anal.*. [Print ed.], Available online 18 April 2011., doi: [10.1016/j.engfailanal.2011.04.002](https://doi.org/10.1016/j.engfailanal.2011.04.002).