

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Ime predmeta: MEHATRONSKI SISTEMI V LOGISTIKI
 Course title: MECHATRONICS SYSTEMS IN LOGISTICS

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
LOGISTIKA SISTEMOV 1. stopnja		1.	2. 1
SYSTEM LOGISTICS 1 st degree		1.	2. <u>1.</u>

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

OBVEZNI
 COMPULSORY

Univerzitetna koda predmeta / University course code:

UN

Predavanja Lectures	Seminar Seminar	Vaje Tutorial			Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
36 a-P 9 e-P		a-V	e-V	LV			90	6
		15	5	10				

Nosilec predmeta / Course coordinator:

DARKO HERCOG

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:

No special conditions.

Vsebina (kratek pregled učnega načrta):

- Osnovni elementi mehanike, Newtonovi zakoni, podajanje sil v ravnini in prostoru, ravnotežje sil, moment, ravnotežje momentov, drsno trenje.
- Pot, hitrost, pospešek, enakomerno gibanje, enakomerno pospešeno gibanje, gibanje s spremenljivim pospeškom, profili gibanja, kroženje, kotna hitrost, kotni pospešek.
- Delo, povprečna in trenutna moč, potencialna in kinetična energija, ohranitev energije.
- Električna napetost, električni tok, osnovni elementi električnih vezij (upor, kondenzator, tuljava), Ohmov zakon, Kirchhoffova zakona, enosmerna električna vezja, električna moč in delo, izmenična napetost in tok, magnetno polje, izmenični tokokrog.

Content (syllabus outline):

- Basic elements of mechanics, Newton's laws, forces in plane and space, balance of forces, moment, balance of moments, sliding friction.
- Displacement, velocity, acceleration, uniform motion, uniformly accelerated motion, motion with varying acceleration, motion profiles, circular motion, angular velocity, angular acceleration.
- Work, average and instantaneous power, kinetic and potential energy, energy conservation.
- Electric voltage, electric current, basic elements of electric circuits (resistor, capacitor, inductor), Ohm's law, Kirchhoff's law, DC electric circuits, electric power and work, AC voltage and current, magnetic field, AC circuits.
- Sensors (inductive, ultrasonic, optical, etc.) and actuators (DC and AC motors).

<ul style="list-style-type: none"> • Senzorji (induktivni, ultrazvočni, optični, itd.) in aktuatorji (motorji na enosmerni in izmenični tok). • Mehatronske naprave, struktura mehatronskih sistemov, komponente mehatronskih naprav, mehatronske naprave v logistiki. 	<ul style="list-style-type: none"> • Mechatronic devices, structure of mechatronic systems, components of mechatronic devices, mechatronic devices in logistics.
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Temeljni literatura in viri / Reading materials:

<p>E-gradivo predmeta.</p> <p>Lerher, T. (2016) Mehatronski sistemi v logistiki. 1, Mehanika. Univerza v Mariboru, Fakulteta za logistiko.</p> <p>Rojko, A., Hercog, D. (2010), Uvod v mehatroniko / Introduction to Mechatronics, Univerza v Mariboru, Fakulteta za elektrotehniko računalništvo in informatiko, ISBN 978-961-248-211-4.</p> <p>Šinko, S., Hercog, D. (2022): Zbirka nalog iz mehanike in elektrotehnike za študente logistike, Fakulteta za logistiko.</p> <p>Bolton, W. (2016), Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 6th Edition, Pearson, ISBN: 978-1292076683.</p> <p>Cetinkunt, S. (2015), Mechatronics with Experiments, 2nd Edition, Wiley, ISBN: 978-1118802465.</p> <p>Hibbeler, R.C. (2013) Mechanics of Materials, 9th edition, Pearson, ISBN: 978-0133254426.</p> <p>Hibbeler, R.C. (2010) Engineering Mechanics - Dynamics, 12th edition, Pearson, ISBN: 978-0136077916.</p>
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Cilji in kompetence:

<p>Cilj predmeta je seznaniti študente s poglobljenimi teoretičnimi znanji s področja mehatronike.</p> <p>Ožji cilji predmeta so:</p> <ul style="list-style-type: none"> • Nadgraditi in poglobiti znanje s področja statike, dinamike in kinematike. • Pojasniti osnovne zakonitosti elektrotehnike. • Pojasniti osnovne principe delovanja pomembnejših komponent mehatronskih naprav. <p>Kompetence, ki jih študenti osvojijo:</p> <ul style="list-style-type: none"> • Spozna in razume temeljne zakonitosti mehanike. • Spozna in razume osnovne zakonitosti elektrotehnike. • Spozna in razume principe delovanja osnovnih komponent mehatronskih naprav.

Objectives and competences:

<p>The objective of this course is to acquaint students with in-depth theoretical knowledge in the field of mechatronics.</p> <p>The narrower goals of the course are:</p> <ul style="list-style-type: none"> • Upgrade and deepen knowledge in the field of statics, kinematics and dynamics. • Explain the basic laws of electrical engineering. • Explain the basic principles of operation of the essential components of mechatronic devices. <p>▲</p> <p>Competences acquired by students:</p> <ul style="list-style-type: none"> • Knows and understands the fundamental laws of mechanics. • Knows and understands the basic laws of electrical engineering. • Knows and understands the working principles of the basic components of mechatronic devices.

Predvideni študijski rezultati:

<p>Študent je ob zaključku predmeta zmožen:</p> <ul style="list-style-type: none"> • razumeti in uporabiti fizikalne zakone mehanike in elektrotehnike, • razumeti in podrobneje razložiti delovanje posameznih električnih in mehanskih komponent mehatronskih naprav, • analizirati in reševati teoretične ter praktične mehatronske probleme v logistiki.

Intended learning outcomes:

<p>At the end of the course, the student is able to:</p> <ul style="list-style-type: none"> • understand and apply the physical laws of mechanics and electrical engineering, • understand and explain in more detail the operation of individual electrical and mechanical components of mechatronic devices, • be able to analyse and solve theoretical and practical mechatronic problems in logistics.

Metode poučevanja in učenja:

Learning and teaching methods:

<p>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).</p> <p>Vaje: pri vajah študent utrdi teoretično znanje in spozna aplikativne možnosti mehatronskih sistemov v logistiki. Vaje se izvajajo na klasični način v predavalnici, v obliki laboratorijskih vaj ter v okviru elektronskega učnega okolja. Del se lahko izvede tudi v e-obliki (na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju).</p>	<p>Lectures: by 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).</p> <p>Tutorials: students enhance their theoretical knowledge and get familiar with the applied opportunities of mechatronics systems in logistics. Tutorials are performed on a classical way in a classroom, in the framework of the laboratory work and in the framework of the electronic learning environment. A part can also be performed in a form of e-learning (via video-conferencing or with the help of specially designed e-material in a virtual electronic learning environment).</p>
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Načini ocenjevanja:	Delež (v %) / Share (in %)	Assessment methods:
<ul style="list-style-type: none"> • Opravljene obveznosti e-predavanj in e-vaj so pogoj za pristop k izpitu. • Pisni izpit • ustni izpit, • laboratorijske vaje. <p>(za uspešno opravljen predmet je potrebno, da so vsi trije deli izpita ocenjeni več kot 50 %)</p>	<p>30%</p> <p>50%</p> <p>20%</p>	<ul style="list-style-type: none"> • Successful completion of e-lectures and e-tutorials is a prerequisite for entering the exam. • Written exam, • oral exam, • laboratory work. <p>(to successfully pass the exam, all three parts of the exam needs to be evaluated above 50 %)</p>

Reference nosilca / Course coordinator's references:

<ol style="list-style-type: none"> 1. P. Bencak, D. Hercog, and T. Lerher, Indoor positioning system based on bluetooth low energy technology and a nature-inspired optimization algorithm, <i>Electronics</i>, vol. 11, no. 3, pp. 1-27, 2022. 2. D. Hercog and B. Gergič, "A Flexible Microcontroller-Based Data Acquisition Device," <i>Sensors</i>, vol. 14, no. 6, pp. 9755-9775, 2014. [Online]. Available: http://www.mdpi.com/1424-8220/14/6/9755. 3. B. Gergič and D. Hercog, "Design and implementation of a measurement system for high-speed testing of electromechanical relays." <i>Measurement</i>, vol. 135, pp. 112-121, 2019.
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