Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION	
Predmet:	Mehanizmi
Subject Title:	Mechanisms

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Tehnika – področje izobraževanja, 3. stopnja		2	zimski/poletni
		ali	
		3	poletni
Education in Engineering, 3rd cycle		2	winter/summer
		or	
		3	summer

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
10	5				75	**3**

Nosilec predmeta / Lecturer: Karl Gotlih

Jeziki / Languages:	**Predavanja / Lecture:**	Slovenščina / Slovene
	Vaje / Tutorial:	

Pogoji za opravljanje študijskih obveznosti:

Ni posebnih pogojev

Prerequisites:

No prerequisites

Vsebina:

Vsebina je razdeljena na poglavja: Uvod in klasifikacija mehanizmov; Prostostne stopnje mehanizmov; Vektorske in matrične metode za opis geometrije mehanizmov (opis s kompleksnimi števili in Denavit Hartenbergova notacija s homogenimi transformacijskimi matrikami); Posebnosti opisa odprtih in zaprtih kinematičnih verig; Kinematika (hitrosti in pospeški na mehanizmu); Direktna in inverzna kinematična naloga; Kinetična in dinamična analiza mehanizmov; Direktna in inverzna dinamična naloga; Metode sinteze mehanizmov; Delovni prostori in njihove lastnosti pri odprtih kinematičnih verigah.

Content (Syllabus outline):

The course comprises the following chapters: Introduction and classification of mechanisms; Degrees of freedom; Vector and matrix methods for geometrical description of mechanisms (description with complex numbers and the Denavit Hartenber notation with homogeneous transformation matrices); Open and closed kinematical chains; Kinematics (velocities and accelerations on the mechanism); Direct and inverse kinematic problem; Kinetic and dynamic analysis of mechanisms; Direct and inverse dynamic problem; Methods of mechanism synthesis; Workspace and its properties for open kinematic chain structures.

Temeljni literatura in viri / Textbooks:

- Erdman, G. Sandor: Machine design, Prentice Hall, 2001
- Erdman, G. Sandor: Mechanism design I, Prentice Hall, 1997
- J. Grosjean: Kinematics and Dynamics of mechanisms, McGraw-Hill, 1991
- H. Soni: Mechanism Synthesis and Analysis, McGraw-Hill, 1974
- S. Molian: Mechanism Design, Pergamon, 1997
- KEGL, Marko, GOTLIH, Karl. Ročični mehanizmi : učbenik. Maribor: Fakulteta za strojništvo, 2009.

Cilji:

- Študenti bodo razumeli kinematične in kinetične zakonitosti s področja mehanizmov
- Študenti bodo uporabili in analizirali delovanje mehanizmov, njihov namen, način modeliranja in metode za analizo.
- Študentje bodo sposobni konstruirati zahtevnejše mehanizme.
- Študentje bodo znali oceniti posamezne mehanizme in njihovo delovanje.

Objectives:

- Students will understand kinematic and kinetic basics in the subject of mechanisms.
- Students will be able to use and analyse the mechanisms, their aims, and methods for modelling and methods for analysis.
- Students will be able to design complicated mechanisms.
- Students will be able to validate different mechanisms and their work.

Predvideni študijski rezultati:

Znanje in razumevanje:

Prepoznavanje mehanizmov, poznavanje metod notacije in analiza in sinteza mehanizmov.

Prenesljive/ključne spretnosti in drugi atributi:

Spretnosti komuniciranja: javna predstavitev seminarskega dela, pisno izražanje pri pisnem izpitu.

Uporaba informacijske tehnologije: uporaba programskih orodij za modeliranje, sintezo in analizo mehanizmov.

Reševanje problemov: modeliranje mehanizmov.

Delo v skupini: skupinsko delo pri seminarju in laboratorijskih vajah.

Intended learning outcomes:

Knowledge and understanding:

Identification of mechanisms, provide knowledge of methods for notation, analysis and synthesis of mechanisms.

Transferable/Key Skills and other attributes:

Communication skills: public presentation of seminary work, manner of expression at written examination.

Use of information technology: use of programming tools for modelling, synthesis and analysis of mechanisms.

Problem solving: modelling of mechanisms.

Working in a group: group work at the seminar and lab work.

Metode poučevanja in učenja:

- Predavanja
- seminarsko delo v skupini
- praktično delo na vajah

Teaching and learning methods:

- lectures
- seminar team work

practical laboratory work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment methods:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
• seminarska naloga,	**30 %**	• seminar work,
• pisni izpit,	**40 %**	• written examination,
• ustni izpit.	**30 %**	• oral examination.

Reference nosilca / Lecturer's references:

GOTLIH, Janez, BREZOČNIK, Miran, BALIČ, Jože, KARNER, Timi, RAZBORŠEK, Boštjan, GOTLIH, Karl. Determination of accuracy contour and optimization of workpiece positioning for robot milling. Advances in production engineering & management, ISSN 1854-6250, Sep. 2017, vol. 12, no. 3, str. 233-244, ilustr., doi: 10.14743/apem2017.3.254. [COBISS.SI-ID 20693782], [JCR, SNIP, WoS do 12. 1. 2020: št. citatov (TC): 5, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 0.83, Scopus do 29. 8. 2019

KARNER, Timi, GOTLIH, Janez, RAZBORŠEK, Boštjan, VUHERER, Tomaž, BERUS, Lucijano, GOTLIH, Karl. Use of single and double fractional Kelvin-Voigt model on viscoelastic elastomer. Smart materials and structures, ISSN 0964-1726. [Print ed.], 2019, vol. 29, no. 1, str. 1-11, doi: 10.1088/1361-665X/ab5337. [COBISS.SI-ID 22775574], [JCR, SNIP, WoS do 13. 12. 2019: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0], kategorija: 1A1 (Z, A', A1/2)

KARNER, Timi, VUHERER, Tomaž, GOTLIH, Janez, RAZBORŠEK, Boštjan, GOTLIH, Karl. Parameters identification method for viscoelastic dielectric elastomer actuator materials using fractional derivatives.

Materials research express. 2018, vol. 5, no. 7, str. 1-15, ilustr. ISSN 2053-1591. http://iopscience.iop.org/article/10.1088/2053-1591/aacecd/meta, DOI: 10.1088/2053-1591/aacecd. [COBISS.SI-ID 21557270], [JCR, SNIP, WoS do 12. 7. 2020: št. citatov (TC): 2, čistih citatov (CI): 1, Scopus do 29. 3. 2020: št. citatov (TC): 2, čistih citatov (CI): 0]