

MEHANIZMI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	MEHANIZMI
Course title:	MECHANISMS
Članica nosilka/UL Member:	UL FS

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Strojništvo, tretja stopnja, doktorski	Konstruktivsko mehanske inženirske znanosti (smer)	1. letnik, 2. letnik	Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0033434

Koda učne enote na članici/UL Member course code: 7109

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorial s	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
90					160	10

Nosilec predmeta/Lecturer: Robert Kunc

Izvajalci predavanj: Robert Kunc

Izvajalci seminarjev:

Izvajalci vaj:

Izvajalci kliničnih vaj:

Izvajalci drugih oblik:

Izvajalci praktičnega usposabljanja:

Vrsta predmeta/Course type: Izbirni predmet /Elective course

Jeziki/Languages:

Predavanja/Lectures:

Angleščina, Slovenščina

Vaje/Tutorial:

Angleščina, Slovenščina

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

Veljajo splošni pogoji za doktorski študij.

General prerequisites for the third level studies.

Vsebina:**Content (Syllabus outline):**

Modeliranje dinamike sistemov togih in/ali elastičnih teles. Snovanje in oblikovanje mehanizmov. Karakteristike mehanizmov. Kinematična in dinamična analiza mehanizmov v širši uporabi. Optimiranje geometrijskih parametrov in modifikacija mehanizmov. Vpliv elastičnosti delov in zračnosti v kinematičnih parih mehanizma na obremenitev in gibanje. Oblikovanje in dinamika pri višjih kinematičnih parih. Računalniško podprta sinteza in analiza mehanizmov pri razvoju strojev in naprav.

Modeling of rigid and/or flexible multibody systems. Methods of mechanism design. Mechanism characteristics. Analysis of kinematics and dynamics of broadly used types of mechanisms. Mechanism modification and optimization. Role of elasticity and clearance in mechanism joints. Role of cam design. Computer-aided synthesis and analysis of mechanism in development process.

Temeljna literatura in viri/Readings:

- [1] Uicker, J. J., Pennock, R. R., Shigley, E. J.: Theory of Machines and Mechanisms; Third Edition; Oxford University Press, 2003: ISBN 0-19-515598-X, COBISS.SI-ID - 5698331
- [2] Norton, L. R.: Design of Machinery (Synthesis and Analysis of Mechanisms and Machines), Second Edition; McGraw-Hill, 1999: ISBN 0-07-116605-X, COBISS.SI-ID - 44430593
- [3] Chironis, P. N.: Mechanisms and Mechanical Devices Sourcebook, Fourth Edition McGraw-Hill, 2007: ISBN- 978-0-07-146761-2, COBISS.SI-ID - 11291158
- [4] Howel, L. L.: Compliant Mechanisms; Wiley-Interscience, 2001: ISBN- - 047138478X, COBISS.SI-ID - 4903195
- [5] Mabie, H. H., Reinholtz, C. F.: Mechanisms and Dynamics of Machinery, Fourth Edition; Wiley, 1987: ISBN- 0-471-80237-9, COBISS.SI-ID - 290331
- [6] Mechanism and Machine Theory; Elsevier, ISSN 1873-3999, COBISS.SI-ID - 118840835, e-vir
- [7] Tryliński, W.: Fine mechanisms and precision instruments : principles of design, Oxford ; New York : Pergamon Press ; Warszawa : Wydawnictwa Naukowo-Techniczne, 1971, COBISS.SI-ID - 5883419

Cilji in kompetence:**Cilji:**

Študente naučiti naprednih postopkov pri snovanju, oblikovanju in analizi mehanizmov, seznaniti s primeri uporabe mehanizmov v praksi, razviti sposobnost kritične ocene z vidika funkcionalnosti, modeliranja ter izdelave mehanizmov. Obvladovanje temeljnega in poglobljenega znanja, povezovanje znanja z različnih področij in aplikacije znanja na določenem področju.

Kompetence:

Študent spozna:

- principe delovanja mehanizmov in namen njihove uporabe, pomen in vlogo mehanizmov v strojih in napravah ter sodobnem proizvodnem procesu,
- pomen definicije mehanskega modela in pristope k formuliranju matematičnega modela mehanizma,
- gradnike mehanizmov in načine povezovanja v funkcionalni sklop,
- prednosti in posebnosti uporabe računalniške podpore pri razvoju in analizi mehanizmov.

Objectives and competences:**Goals:**

The principal goal is to teach the student advanced methods of mechanism design and development, to introduce diverse mechanism applications, to evolve the student's ability of critical judgment of the mechanism from functionality, modeling and production point of view. Further goals are, to give basic and in-depth information about the mechanism science and related engineering fields, and to evolve the application of the knowledge in practice.

Competences:

The student acquires the knowledge of:

- principles of mechanism operation and application, and their role in manufacturing processes,
- the meaning of mechanical model definition and approaches to mechanism mathematical model formulation,
- mechanism members and joints, assembly requirements,
- advantages and specialties of computer support in mechanism development and analysis.

Predvideni študijski rezultati:

Študent spozna:

- principe delovanja mehanizmov in namen njihove uporabe, pomen in vlogo mehanizmov v strojih in napravah ter sodobnem proizvodnem procesu,
- pomen definicije mehanskega modela in pristope k formuliranju matematičnega modela mehanizma,
- gradnike mehanizmov in načine povezovanja v funkcionalni sklop,
- prednosti in posebnosti uporabe računalniške podpore pri razvoju in analizi mehanizmov.

Intended learning outcomes:

The student acquires the knowledge of:

- principles of mechanism operation and application, and their role in manufacturing processes,
- the meaning of mechanical model definition and approaches to mechanism mathematical model formulation,
- mechanism members and joints, assembly requirements,
- advantages and specialties of computer support in mechanism development and analysis.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje,

Learning and teaching methods:

Lectures, laboratory practice & seminar

seminarsko delo, e-izobraževanje, konzultacije. Seminarsko delo v čim večji meri navezuje se na področje doktorskega raziskovanja. Študij z uporabo priporočene literature.	work, e-education, consulting. The seminar work is related, as much as possible, to the student's doctoral research field. Study on a recommended literature basis.
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Načini ocenjevanja:	Delež/Weight	Assessment:
Ustni izpit, poročilo o seminarskem delu. Pogoji za opravljanje ustnega izpita je uspešno izdelano in pozitivno ocenjeno seminarsko delo. Način (ustno izpraševanje, naloge, projektni seminar) <ul style="list-style-type: none"> • naloge (30%) • projektni seminar (40%) • ustno izpraševanje (30%) 		Oral exam, report on seminar work. The condition for admission to oral exam is successful completion of seminar work, rewarded with a passing grade. Method (oral examination, assignments, project seminar) • assignments (30%) • project seminar (40%) • oral examination (30%)

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

izr. prof. dr. Robert KUNC

1. TRAJKOVSKI, Jovan, AMBROŽ, Miha, KUNC, Robert. Gravel arrester beds as a safety measure at the motorway exit ramps : experimental and numerical study. Road materials and pavement design. 2023, str. 1-16, ilustr. ISSN 2164-7402. <https://www.tandfonline.com/doi/full/10.1080/14680629.2023.2194442>, DOI: 10.1080/14680629.2023.2194442. [COBISS.SI-ID 1. 147609091]
2. BASAN, Robert, FRANULOVIC, Marina, PREBIL, Ivan, KUNC, Robert. Study on Ramberg-Osgood and Chaboche models for 42CrMo4 steel and some approximations. Journal of constructional steel research. [Print ed.]. sep. 2017, vol. 136, str. 65-74, ilustr. ISSN 0143-974X. <http://www.sciencedirect.com/science/article/pii/S0143974X17302341>, DOI: 10.1016/j.jcsr.2017.05.010. [COBISS.SI-ID 2. 15531035]
3. TRAJKOVSKI, Jovan, KUNC, Robert, PERENDA, Jasenko, FAZARINC, Matevž, PREBIL, Ivan. Blast resistant trash receptacles with blast loading redirection : comparative analyses. International journal of computational methods and experimental measurements. [Print ed.]. 2016, vol. 4, nr. 3, str. 201-212, ilustr. ISSN 2046-0546. <http://www.witpress.com/elibrary/cmем-volumes/4/3/1242>, DOI: 10.2495/CMEM-V4-N3-201-212. [COBISS.SI-ID 3. 15617819]
4. VOJE, Andrej, KUNC, Robert. Podvodni skuter za potapljače : patent SI 25691 A, 2020-02-28. Ljubljana: Urad Republike Slovenije za intelektualno lastnino, 2020. [13] str., ilustr.

<https://worldwide.espacenet.com/patent/search/family/067847772/publication/SI25691A?q=si25691&queryLang=en%3Ade%3Afr>. [COBISS.SI-ID 4. 61033475],
patentna družina: P- 201800177, 2018-08-13; AU2019322477A1, 2021-03-11;
CA3108054A1, 2020-02-20; CN112566703A, 2021-03-26; KR20210041610A, 2021-
04-15; SG11202101110UA, 2021-03-30; WO2020036540A1, 2020-02-20
5. AMBROŽ, Miha, TRAJKOVSKI, Jovan, ZUPAN, Samo, ŽEROVNIK, Andrej,
NOVAK, Aleksander, KRANJEC, Matej, KORINŠEK, Jernej, SELAN, Rok, KUNC,
Robert. Testiranje pojemkov osebnega vozila pri kontrolirani vožnji v območje
izletne cone in izvedba računalniških simulacij : končno poročilo o rezultatih
meritev. Ljubljana: Fakulteta za strojništvo, Katedra za modeliranje v tehniki in
medicini (KMTM), 2019. 15 f., ilustr. [COBISS.SI-ID 16866331]