Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Analitična mehanika**
Course title:	**Analytical Mechanics**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj		**4**	**8**
Five-year master's degree program Subject teacher		**4**	**8**

Vrsta predmeta / Course type izbirni/elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		**15**			**90**	**5**

Nosilec predmeta / Lecturer: Milan Svetec

Jeziki / Languages:		
	Predavanja / Lectures:	slovenski/Slovene
	Vaje / Tutorial:	slovenski/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Pogojev ni. Priporočljivo je predznanje iz mehanike inmatematične fizike. Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno. Opravljena seminarska naloga je pogoj za pristop k pisnemu in ustnemu izpitu.	None. Recommended is pre- knowledge from: mechanics and mathematical physics. Each of the listed obligations in the assessment methods must be completed with a positive grade. Completed seminar paper is a prerequisite for taking the written and oral exams.

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

Pregled osnovnih zakonov mehanike. Lagrangejeve enačbe. Centralne sile in problem dveh teles. Kinematika togega telesa. Pospešeni koordinatni sistemi Hamiltonove enačbe Posebna teorija relativnosti	Survey of the basic principles in mechanics. Lagrange equations. Central forces and 2-body problem. Rigid body kinematics. Accelerated frames of reference Hamilton equations. Special theory of relativity

Temeljni literatura in viri / Readings:

- L. D. Landau, E. M. Lifshitz, Mechanics, (Pergamon Press, Oxford, 1976).
- H. Goldstein, C. Poole, J. Safko, Classical Mechanics, (Addison Wesley, Reading, 2002).
- G. M. Calkin, Lagrangian and Hamiltonian Mechanics (World Scientific, Singapore, 1998).
- S. Pahor, Uvod v analitično mehaniko, (DMFA, 1995).
- M. Svetec, Teorijska mehanika : (zapiski predavanj - rokopis), 2023.

Cilji in kompetence:	**Objectives and competences:**
Študenti pridobijo bolj poglobljeno znanje s področja klasične in analitične mehanike.	Students acquire deeper knowledge from classical and analytical mechanics.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent zna pretvori problem iz mehanike v kompleksnejši geometriji v formalizem z Lagrangianom ali Hamiltonianom in ga tudi uspešno rešiti: analitično ali numerično. Študent je uspešen pri generaliziranju osnovnih pojmov, kot sta koordinata in gibalna količina. Študent zna v didaktičnem smislu bolje ponazoriti rotacijo teles v prostoru; podobno velja za nihanje. Študent bolj sistematično poveže med seboj osnovne fizikalne količine, opredeljene pri mehaniki. Študent razume povezave med več različnimi vejami fizike.	**Knowledge and understanding:** The student is able to transform the problem in the mechanics with more complex geometry into the formalism using Lagrangian or Hamiltonian, and is also able to solve it either in analytical or numerical way. The student is succesful in generalization of basic concepts, such as coordinate and linear momentum. The has a didactic skill to illuminate the rotation of bodies in space; similarly holds for oscillation. The student is more systematic in relating the basic physics quantities, defined within mechanics. The student understands relations between some different areas of physics.
Prenesljive/ključne spretnosti in drugi atributi: Rešitev problemov z matematičnimi orodji in celosten pristop k reševanju problemov.	**Transferable/Key Skills and other attributes:** Solving of problems with mathematical tools and gained global approach on solving a problem.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja Teoretične računske vaje Domače računske vaje	Lectures Theoretical excercises Home theoretical excercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
pisni izpit		written exam
ustni izpit	**25**	oral exam
seminarska naloga	**50**	seminar paper
	25	

Opombe:
Pisni izpit se lahko nadomesti z dvema pisnima kolokvijema.

Comments:
Written exam can be replaced by two written midterm examinations.

Reference nosilca / Lecturer's references:

SVETEC, Milan, HARKAI, Saša, PAL, Kaushik, KRALJ, Samo. Twist disclinations mediated transformations in confined nematic liquid crystals. Journal of molecular liquids. [Online ed.]. 15 Nov. 2024, part b, [article no.] 126138, 10 str., ilustr. ISSN 1873-3166. https://www.sciencedirect.com/science/article/pii/S0167732224021974?via%3Dihub, DOI: 10.1016/j.molliq.2024.126138. [COBISS.SI-ID 214061315]

JELEN, Žiga, SVETEC, Milan, MAJERIČ, Peter, KAPUN, Stanko, RESMAN, Lara, ČEH, Tatjana, HAJRA, Granit, RUDOLF, Rebeka. Contaminants in the soil and typical crops of the Pannonian region of Slovenia. Sustainability. Oct. 2024, vol. 16, iss. 19, [article no.] 8678, 15 str., ilustr. ISSN 2071-1050. https://dk.um.si/IzpisGradiva.php?id=91211, https://www.mdpi.com/2071-1050/16/19/8678, dCOBISS, DOI: 10.3390/su16198678. [COBISS.SI-ID 214094851]

SHAHRIARI, Zahra, NAZARIMEHR, Fahimeh, RAJAGOPAL, Karthikeyan, JAFARI, Sajad, PERC, Matjaž, SVETEC, Milan. Cryptocurrency price analysis with ordinal partition networks. Applied mathematics and computation. [Print ed.]. Oct. 2022, vol. 430, str. 1-14. ISSN 0096-3003. DOI: 10.1016/j.amc.2022.127237. [COBISS.SI-ID 110070019]

KLINSHOV, Vladimir, KOVALCHUK, Andrey V., FRANOVIĆ, Igor, PERC, Matjaž, SVETEC, Milan. Rate chaos and memory lifetime in spiking neural networks. Chaos, solitons and fractals. [Print ed.]. May 2022, vol. 158, str. 1-7. DOI: 10.1016/j.chaos.2022.112011. [COBISS.SI-ID 102476291]