

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:		Mehanika 1				
Course title:		Mechanics 1				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year	Semester Semester	
Univerzitetni študijski program Matematika		ni smeri		3	prvi	
First cycle academic study programme Mathematics		none		3	first	
Vrsta predmeta / Course type				obvezni		
Univerzitetna koda predmeta / University course code:				M0225		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30			90	5
Nosilec predmeta / Lecturer:		doc. George Mejak, doc. Pino Koc				
Jeziki / Languages:	Predavanja / Lectures:	slovenski/Slovene				
	Vaje / Tutorial:	slovenski/Slovene				
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:		
Opravljeni predmeti Analiza 1, Algebra 1, Fizika 1, Analiza 2a in Analiza 2b.				Completed courses Analysis 1, Algebra 1, Physics 1, Analysis 2a and Analysis 2b.		
Vsebina:				Content (Syllabus outline):		

<p>Kinematika točke: Definicija osnovnih kinematičnih količin. Opis gibanja v krivočrtnih koordinatnih sistemih, polarni, cilindrični in krogelni koordinatni sistem. Diferencialna geometrija krivulj v prostoru, intrinzični koordinatni sistem.</p> <p>Osnove Newtonove mehanike: Galilejeva struktura, Galilejeve transformacije. Princip determiniranosti, Newtonovi zakoni. Delo, energija, izrek o delu, izrek o energiji.</p> <p>Premočrtno gibanje: Integrabilnost premočrtnega gibanja. Kvalitativni opis gibanja. Fazna ravnina. Periodično gibanje. Harmonični oscilator, harmonična aproksimacija periodičnega gibanja.</p> <p>Redukcija na premočrtno gibanje: Gibanje v polju centralne sile. Gibanje v polju gravitacijske sile, Keplerjevi zakoni, Bineteva formula. Integrabilnost gibanja v polju centralne sile, redukcija na premočrtno gibanje. Gibanje po gladki krivulji.</p> <p>Sistem materialnih točk: Enačba gibanja masnega središča, izrek o vrtilni količini. Problem dveh teles.</p> <p>Kinematika togega telesa: Relativni in absolutni koordinatni sistem, vektor kotne hitrosti. Togo gibanje, razcep togega gibanja na translatorno in rotacijsko gibanje. Eulerjevi koti.</p> <p>Dinamika togega telesa: Eulerjeve dinamične enačbe. Prosta vrtavka. Gibanje okrog stalne osi. Lagrangeeva vrtavka.</p>	<p>Point kinematics: Definitions of basic kinematic variables. Kinematics in curvilinear coordinate systems, polar, cylindrical and spherical coordinate systems. Differential geometry of curves, intrinsic coordinates.</p> <p>Basic principles of Newtonian mechanics: Galileoian structures and transformations. Principle of the determinism, Newton's laws. Work, energy, work and energy theorems.</p> <p>Rectilinear motion: Integrability. Qualitative description. Phase portrait. Periodic motion. Harmonic oscillator, harmonic approximation of the periodic motion.</p> <p>Reduction to the one degree motion: Central force motion. Integrability of the central force motion, reduction to the linear motion. Motion in the gravitational field, Kepler's laws, Binet's formula. Motion without friction along a curve.</p> <p>System of particles: Center of mass, angular momentum theorem. Two body problem.</p> <p>Rigid body kinematics: Relative and absolute coordinate systems, angular velocity vector. Rigid motion, decomposition into translation and rotation motion. Euler angles.</p> <p>Rigid body dynamics: Euler equations of motion. Rotation around a fixed axis. Torque free motion. The heavy symmetric top.</p>
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Temeljna literatura in viri / Readings:

J. M. Knudsen, P. G. Hjorth: Elements of Newtonian Mechanics : Including Nonlinear Dynamics, 3rd edition, Springer, Berlin, 2002.

G. R. Fowles, G. L. Cassiday: Analytical Mechanics, 7th edition, Brooks/Cole, Pacific Grove, 2005.

W. Greiner: Classical Mechanics : Point Particles and Relativity, Springer, New York, 2004.

Cilji in kompetence:

Predstavitev osnovnih pojmov in vsebin Newtonove mehanike s poudarkom na korektni matematični formulaciji in povezovanju že osvojenih matematičnih znanj.

Objectives and competences:

Mathematical correct presentation of the basic Newtonian mechanics with special attention to connect already acquired mathematical knowledge of students.

Predvideni študijski rezultati:

Znanje in razumevanje: Poznavanje in razumevanje osnovnih pojmov in principov Newtonove mehanike.

Uporaba: Temelj za nadgraditev osvojenega znanja s specifičnimi znanji iz prakse s področja mehanike. Osnova za nadaljnji študij predmetov s področja mehanike.

Refleksija: Povezovanje osvojenega matematičnega znanja v okviru enega predmeta in njegova uporaba na področju mehanike.

Prenosljive spretnosti – niso vezane le na en predmet: Celovit pogled na matematične metode v okviru mehanike. Reševanje nalog in problemov iz sorodnih področij uporabne matematike.

Intended learning outcomes:

Knowledge and understanding: Familiarity and understanding of basic principles of Newtonian mechanics.

Application: Application of basic principles of mechanics to the modellisation of real world problems. Base for further study of mechanics.

Reflection: Interconnection of the already acquired mathematical knowledge within a single course and application of it in the field of Mechanics.

Transferable skills: A global understanding of mathematical methods. Acquiring modellisation skills for real world problems.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, vaje, konzultacije	Lectures, exercises, consultations
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		Delež (v %) / Weight (in %)	Assessment:
Načini ocenjevanja:			
Način (pisni izpit, ustno izpraševanje, naloge, projekt): 2 kolokvija namesto izpita iz vaj, izpit iz vaj, izpit iz teorije ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)		50% 50%	Type (examination, oral, coursework, project): 2 midterm exams instead of written exam, written exam oral exam grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

<p>Pino Koc:</p> <ul style="list-style-type: none"> - KOC, Pino, ŠTOK, Boris. Computer-aided identification of the yield curve of a sheet metal after onset of necking. Computational materials science, ISSN 0927-0256. [Print ed.], 2004, letn. 31, št. 1/2, str. 155-168 [COBISS.SI-ID 7467803] - KOC, Pino, ŠTOK, Boris. Usage of the yield curve in numerical simulations. Strojniški vestnik, ISSN 0039-2480, 2008, letn. 54, št. 12, str. 821-829 [COBISS.SI-ID 10772507] - UREVC, Janez, KOC, Pino, ŠTOK, Boris. Characterization of material parameters used in the mathematical modelling of arc welding and heat treatment processes. Transactions of FAMENA, ISSN 1333-1124, 2011, vol. 35, no. 4, str. 1-14, ilustr [COBISS.SI-ID 12226587] <p>George Mejak:</p> <ul style="list-style-type: none"> - MEJAK, George. Vogalna singularnost torzije kompozitne palice = The corner singularity of composite bars in torsion. Strojniški vestnik, ISSN 0039-2480, 2002, letn. 48, št. 11, str. 571-579 [COBISS.SI-ID 5643291] - MEJAK, George. Finite element solution of a model free surface problem by the optimal shape design approach. International journal for numerical methods in engineering, ISSN 0029-5981. [Print ed.], 1997, vol. 40, str. 1525-1550 [COBISS.SI-ID 9983833] - MEJAK, George. Optimization of cross-section of hollow prismatic bars in torsion. Communications in numerical methods in engineering, ISSN 1069-8299, 2000, vol. 16, št. 10, str.
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