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):**

Osnove Newtonove mehanike: Galilejeva struktura, Galilejeve transformacije. Princip determiniranosti, Newtonovi zakoni. Delo, energija, izrek o delu, izrek o energiji.

Premočrtno gibanje: Integrabilnost premočrtnega gibanja. Kvalitativni opis gibanja. Fazna ravnina. Periodično gibanje. Harmonični oscilator, harmonična aproksimacija periodičnega gibanja.

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.

Sistem materialnih točk: Enačba gibanja masnega središča, izrek o vrtilni količini. Problem dveh teles.

Kinematika togega telesa: Relativni in absolutni koordinatni sistem, vektor kotne hitrosti. Togo gibanje, razcep togega gibanja na translatorno in rotacijsko gibanje. Eulerjevi koti.

Dinamika togega telesa: Eulerjeve dinamične enačbe. Prosta vrtavka. Gibanje okrog stalne osi. Lagrangeeva vrtavka.

Basic principles of Newtonian mechanics: Galileoian structures and transformations. Principle of the determinisem, Newton's laws. Work, energy, work and energy theorems.

Rectilinear motion: Integrability. Qualitative description. Phase portrait. Periodic motion. Harmonic oscillator, harmonic approximation of the periodic motion.

Reduction to the one degree motion: Central froce motion. Integrability of the central froce motion, reduction to the linear motion. Motion in the gravitational field, Kepler's laws, Binet's formula. Motion without friction along a curve.

System of particles: Center of mass, angular momentum theorem. Two body problem.

Rigid body kinematics: Relative and absolute coordinate systems, angular velocity vector. Rigid motion, decomposition into translation and rotation motion. Euler angles.

Rigid body dynamics: Euler equations of motion. Rotation around a fixed axis. Torque free motion. The heavy symmetric top.

Temeljni 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:

Objectives and competences:

| Predstavitev osnovnih pojmov in vsebin Newtonove mehanike s poudarkom na korektni matematični formulaciji in povezovanju že osvojenih matematičnih znanj. | Mathematical correct presentation of the basic Newtonian mechanics with special attention to connect already acquired mathematical knowledge of students. |

Predvideni študijski rezultati:

Intended learning outcomes:

| 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. | 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 |

Načini ocenjevanja: Delež (v %) / Weight (in %)   **Assessment:**

| Način (pisni izpit, ustno izpraševanje, naloge, projekt):
2 kolokvija namesto izpita iz vaj, izpit iz vaj,

izpit iz teorije

ocene: 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: 5 (fail), 6-10 (pass) (according to the Statute of UL) |

Reference nosilca / Lecturer's references:

Pino Koc:

– 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]

George Mejak:

– 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. 687-695 [COBISS.SI-ID 9984089]