UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)			
Predmet:	Mehanika 1		
Course title:	Mechanics 1		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Enoviti magistrski študijski program Pedagoška matematika	ni smeri	3 ali 4	prvi
Integrated Master's study programme Pedagogical Mathematics	none	3 or 4	first

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code:	M0531

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. dr. Pino Koc, doc. dr. George Mejak

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpis v letnik študija. Opravljeni predmeti Analiza 1, Algebra 1, Fizika 1, Analiza 2a in Analiza 2b.	Enrolment in the programme. Completed courses Analysis 1, Algebra 1, Physics 1, Analysis 2a and Analysis 2b.
Vsebina:	**Content (Syllabus outline):**

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. 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.	Point kinematics: Definitions of basic kinematic variables. Kinematics in curvilinear coordinate systems, polar, cylindrical and spherical coordinate systems. Differential geometry of curves, intrinsic coordinates. 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:

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

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: 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:

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. 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. 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]

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]