UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)			
Predmet:	Analitična mehanika		
Course title:	Analytical mechanics		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Magistrski študijski program Finančna matematika	ni smeri	1 ali 2	prvi ali drugi
Master's study programme Financial Mathematics	none	1 or 2	first or second

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code:	M2118

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike** **študija**	**Samost. delo** **Individ. work**	**ECTS**
30	**15**	**30**			**105**	**6**

Nosilec predmeta / Lecturer:	doc. dr. George Mejak

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene, angleški / English
	Vaje / Tutorial:	slovenski / Slovene, angleški / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpis v letnik študija.	Enrolment in the programme.
Vsebina:	**Content (Syllabus outline):**

Lagrangeeva mehanika: Konfiguracijski prostor. Holonomni, neholonomni sistemi vezi. Princip virtualnega dela. D'Alembertov princip. Lagrangeeve enačbe. Konstante gibanja, ciklične spremenljivke, Jacobijeva energijska funkcija, izrek Emmy Noether. Variacijski princip. Majhna nihanja okoli ravnovesne lege. Posplošen potencial. Hamiltonova mehanika: Legendrova transformacija. Hamiltonova funkcija, kanonski sistem. Poissonov oklepaj, odvajanje vzdolž rešitve kanonskega sistema, konstante gibanja, Poissonov izrek. Kanonska transformacija, simplektična matrika, simplektični pogoj. Rodovne funkcije. Hamilton-Jacobijeva enačba	Lagrangian mechanics: Configurational space. Holonomic and nonholonomic constraints. Principle of virtual work. D'Alember principle. Lagrangian equations. Constant of motion. Cyclic variables, Jacobi energy function, Emmy-Noether theorem. Variational principles. Small oscillations. Generalized potential. Hamiltonian mechanics: Legendre transformation. Hamiltonian function, canonical system. Poisson bracket, differentiation along solution of the canonical system, integrals of motion, Poisson theorem. Canonical transformation, symplectic matrix, symplectic condition. Generating functions. Hamilton-Jacobi equation.

Temeljni literatura in viri / Readings:

V. I. Arnold: Mathematical Methods of Classical Mechanics, 2nd edition, Springer, New York, 1997.

H. Goldstein, C. P. Poole, J. L. Safko: Classical Mechanics, 3rd edition, Addison-Wesley, Reading, 2002.

A. Fasano, S. Marmi, Analytical Mechanics: An Introduction, Oxford University Press, Oxford, 2006

J. V. José, E. J. Saletan: Classical Dynamics : A Contemporary Approach, Cambridge Univ. Press, Cambridge, 1998.

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je pridobiti osnovna znanja s področja analitične mehanike. Vsebine predmeta omogočajo uspešno reševanje dinamičnih problemov in ponazarjajo uporabo različnih matematičnih področij pri reševanju problemov s področja mehanike.	The goal is to obtain basic knowledge of principles of analytical mechanics. Mastering them enables problem solving of dynamical problems and to understand the role of mathematics in mechanics

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: Poznavanje in razumevanje osnovnih metod analitične mehanike Uporaba: Osnova za nadgraditev osvojenega znanja s specifičnimi modeli iz področja klasične mehanike. Temelj za nadaljnji poglobljeni študij metod klasične in relativistične mehanike. Refleksija: Povezovanje osvojenega matematičnega znanja v okviru enega predmeta in njegova uporaba na področju analitične mehanike. Prenosljive spretnosti – niso vezane le na en predmet: študent razvija sposobnost predstavitve problema na jasen in logičen način. Nauči se formulirati problem, izbrati ustrezni model, analizirati rešitev in preveriti veljavnost modela in rešitve.	Knowledge and understanding: Knowledge and understanding of basic prnciples and methods of analytical mechanics. Application: Application of the learnt methods in solving dynamical real word problems. First step for further graduate level study of methods of classical and relativistic mechanics. Reflection: Crossbreeding of different mathematical subjects within a single course and their application. Transferable skills: Students develop abilities to clearly and logically formulate problems. They learn to critically assess modeling by analyzing their predictions and comparing them with real examples.

Metode poučevanja in učenja:	**Learning and teaching methods:**
predavanja, vaje, seminar, domače naloge, konzultacije	Lectures, exercises, seminar, homeworks, consultations

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): izpit iz vaj (2 kolokvija ali pisni izpit) ustni izpit 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:

George Mejak:

MEJAK, George. On extension of functions with zero trace on a part of boundary. Journal of mathematical analysis and applications, ISSN 0022-247X. [Print ed.], 1993, let. 175, str. 305-314. [COBISS.SI-ID 5828441]

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. Eshebly tensors for a finite spherical domain with an axisymmetric inclusion. European journal of mechanics. A, Solids, ISSN 0997-7538. [Print ed.], 2011, vol. 30, iss. 4, str. 477-490. [COBISS.SI-ID 16025177]