



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Numerične metode v fiziki
Course title:	Numerical methods in Physics

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	/	3	6
Five-year master's degree program Subject Teacher	/		

Vrsta predmeta / Course type izbirni / elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30		15	30		135	7

Nosilec predmeta / Lecturer: Zidanšek Aleksander

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Predznanje iz osnov računalništva, analize in algebre, matematične fizike.

Prerequisites:

Preknowledge from computing, calculus, algebra and mathematical physics.

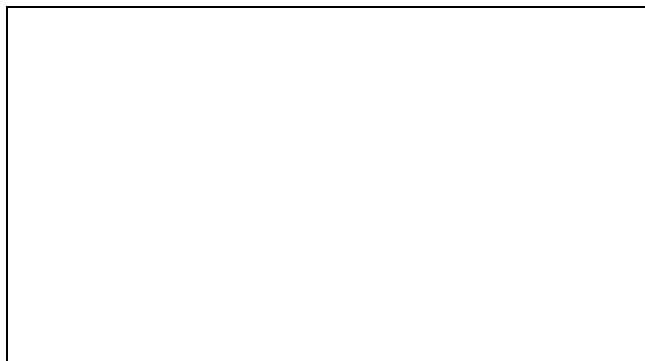
Vsebina:

Programiranje, delo s tabelami. Numerično reševanje in fizikalno ozadje: sistemi linearnih enačb, nelinearne enačbe, interpolacija, odvajanje, integriranje, navadne diferencialne enačbe, parcialne diferencialne enačbe. Metoda Monte Carlo, metoda molekularne dinamike, simulacija delovanja možganov.

Content (Syllabus outline):

Programming, work with arrays. Numerical solutions and physical background: linear equations systems, nonlinear equations, interpolation, derivation and integration, ordinary differential equations, partial differential equations. Monte Carlo method, molecular dynamics methods, simulation of the brain processes. Using of symbolic packet (Mathematica) by solving some physical problems.

Uporaba simbolnega paketa (recimo mathematica) pri reševanju izbranih fizikalnih problemov.



Temeljna literatura in viri / Readings:

- W.H. Press in dr.: Numerical Recipes in C, Cambridge University Press, 1994
- Z. Bohte: Numerične metode. Ljubljana: DMFA, 1985,
- M. L. Abell, J. P. Braselton: Mathematica by example. London: Academic press, 1992.
- F. J. Vesely: Computational Physics, An Introduction, Plenum Press, 1994.

Cilji in kompetence:

Študentje usvojijo dodatna teoretična in praktična znanja iz uporabe računalnika pri reševanju fizikalnih problemov.

Objectives and competences:

Students acquire theoretical and practical knowledge about the use of computer by solving physical problems.

Predvideni študijski rezultati:

Znanje in razumevanje:
Reševanje fizikalnih problemov z numeričnimi metodami.

Prenosljive/ključne spretnosti in drugi atributi:
Pregled različnih numeričnih metod. Razlikovanje med analitičnimi in numeričnimi rezultati.

Intended learning outcomes:

Knowledge and understanding:
Solving physical problems with numerical methods.

Transferable/Key Skills and other attributes:
Review of the various numerical methods.
Difference between analytical and numerical results.

Metode poučevanja in učenja:

Predavanja
Laboratorijsko delo z računalniki.

Learning and teaching methods:

Lectures
Laboratory work with computers.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
pisni izpit	35	written exam
ustni izpit	35	oral exam
dnevnik lab. vaj	30	logbook of laboratory work

Reference nosilca / Lecturer's references:

- KRALJ, Samo, CORDOYIANNIS, George, JESENEK, Dalija, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, NOVAK, Nikola, AMENITSCH, Heinz, KUTNJAK, Zdravko. Dimensional crossover and scaling behavior of a smectic liquid crystal confined to controlled-pore glass matrices. *Soft matter*, 2012, vol. 8, issue 8, str. 2460-2470, doi: 10.1039/C1SM06884A. [COBISS.SI-ID 25534759]
- ZIDANŠEK, Aleksander, AMBROŽIČ, Milan, MILFELNER, Maja, BLINC, Robert, LIOR, Noam. Solar orbital power : sustainability analysis. *Energy (Oxford)*. [Print ed.], 2011, vol. 36, no. 4, str. 1986-1995. [COBISS.SI-ID 24602919]
- CORDOYIANNIS, George, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, KUTNJAK, Zdravko, AMENITSCH, Heinz, NOUNESIS, George, KRALJ, Samo. Influence of confinement in controlled-pore glass on the layer spacing of smectic-A liquid crystals. *Phys. rev., E Stat. nonlinear soft matter phys. (Print)*, 2009, vol. 79, no. 5, str. 051703-1-051703-7. [COBISS.SI-ID 22602791]
- KRALJ, Samo, CORDOYIANNIS, George, ZIDANŠEK, Aleksander, LAHAJNAR, Gojmir, AMENITSCH, Heinz, ŽUMER, Slobodan, KUTNJAK, Zdravko. Presmectic wetting and supercritical-like phase behavior of octylcyanobiphenyl liquid crystal confined to controlled-pore glass matrices. *J. chem. phys.*, 2007, vol. 127, no. 15, str. 154905-1-154905-9. [COBISS.SI-ID 21141287]
- BLINC, Robert, SELIGER, Janez, ZIDANŠEK, Aleksander, ŽAGAR, Veselko, MILIA, Fani, ROBERT, Hector. [¹⁴N nuclear quadrupole resonance of some sulfa drugs. *Solid state nucl. magn. reson.*. [Print ed.], 2006, vol. 30, str. 61-68. [COBISS.SI-ID 20015655]