Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Hamiltonska dinamika v magnetnih nano-tekočinah**
Course title:	**Hamiltonian dynamics of magnetic nanofluids**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	**1., 2. ali 4.**
PHYSICS		1. ali 2.	**1., 2. or 4.**

Vrsta predmeta / Course type Izbirni za vse module

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Mentorstvo Mentorship	Samost. delo Individ. work	ECTS
15					**165**	**6**

Nosilec predmeta / Lecturer: **Victor Sokolov**

Jeziki / Languages:		
	Predavanja / Lectures:	angleško/ English
	Vaje / Tutorial:	

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

Predznanje iz klasične in moderne fizike in iz matematične fizike

Prerequisits:

Pre-knowledge of classical physics, modern physics, and mathematical methods in physics

Vsebina:

1) Hamiltonski opis idealne tekočine
2) Hamiltonski opis idealne magnetne nano-tekočine z ravnovesno magnetizacijo
3) Hamiltonski opis idealne magnetne nano-tekočine z »zamrznjeno« magnetizacijo
4) Teorija valovnega razširjanja v magnetnih nano-tekočinah. Primerjava teoretičnih in eksperimentalnih rezultatov

Content (Syllabus outline):

1) Hamiltonian description of the ideal fluid
2) Hamiltonian description of the ideal magnetic nanofluid with equilibrium magnetization
3) Hamiltonian description of the ideal magnetic nanofluid with frozen-in magnetization

5) Aplikacije magnetnih nano-tekočin	4) Theory of waves propagation in magnetic nanofluids. Comparison of theoretical results with experimental data 5) Applications of magnetic nanofluids

Temeljni literatura in viri / Readings:

1) R. E. Rosensweig Ferrohydrodynamics. Dover Publications, 1997.

2) P. M. Chaikin, T. C. Lubensky, Principles of Condensed Matter Physics, Cambridge University Press, Cambridge, 1995.

3) A. N. Beris, B. J. Edwards Thermodynamics of Flowing System with Internal Microstructure, Oxford University Press,Oxford,1993.

4) Blums, A. Cebers, M.M. Maiorov, Magnetic Fluids. Walter de Gruyter, Berlin, New York, 1997.

5) Ferrofluids, Magnetically Controllable Fluids and Their Applications, Editor: Odenbach S. Lect. Notes Phys. 594, Springer, Berlin, 2002.

Cilji in kompetence:	**Objectives and competences:**
Študenti pridobijo napredna znanja s področja Hamiltonskega formalizma fizike kompleksnih tekočin.	Students acquire advanced knowledge on application of Hamiltonian formalism in physics of complex fluids.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje ključnih metod Hamiltonovega formalizma. Prenesljive/ključne spretnosti in drugi atributi: Rešitev problemov z matematičnimi orodji, numeričnimi metodami, univerzalnosti v fiziki in celosten pristop k reševanju problemov	Knowledge and understanding: Understanding of key methods in Hamiltonian formalism. Transferable/Key Skills and other attributes: Solving of problems with mathematical tools, universalities in physics

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in reševanje zastavljenih problemov.	Lectures and solving of defined problems.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Dva seminarja	**50%**	Two seminars
Ustni izpit	**50%**	Oral exam

Reference nosilca / Lecturer's references:

1. A.G. Meshkov, V.V. Sokolov, *On third order integrable vector Hamiltonian equations*, J. Geom. Phys., 113(1), 206-214 (2017), Scopus: 2-s2.0-85008599127.
2. V.V. Sokolov, A.V. Turbiner, *Quasi-exact-solvability of the A_2/G_2 Elliptic model: algebraic form, sl(3)/g(2) hidden algebra, polynomial eigenfunctions*, J. Phys. A: Math. Theor. 48, 155201 (2015); arXiv:1409.7439, WoS: 000352113800002, Scopus: 2-s2.0-84925811124.
3. A.M. Kamchatnov, V.V. Sokolov, *Nonlinear waves in two-component Bose-Einstein condensates: Manakov system and Kowalevski equations*, Phys. Rev. A 91, 043621 (2015); arXiv:1501.01229, WoS: 000352845900006, Scopus: 2-s2.0-84929497573.
4. A. Odesskii, V. Rubtsov, V. Sokolov, *Parameter-dependent associative Yang-Baxter equations and Poisson brackets*, Int. J. Geom. Methods Mod. Phys. 11(9), 1460036 (2014) [18 pages]; arXiv:1311.4321, WoS: 000344230400013, Scopus: 2-s2.0-84908628170.
5. A.G. Meshkov, V.V. Sokolov, *Integrable evolution Hamiltonian equations of the third order with the Hamiltonian operator D_x*, J. Geom. Phys., 85, 245-251 (2014); arXiv:1401.6844, WoS: 000342540500021, Scopus: 2-s2.0-84900943349.