



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Sodobna fizika
Course title:	Contemporary physics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1.	1., 2. ali 3.
PHYSICS		1.	1., 2. or 3.

Vrsta predmeta / Course type

Obvezni za modul Izobraževalna fizika 1
Izbirni za modul Biofizika 3 in modul Fizika 1, 2, 3

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Mentorstvo Mentorship	Samost. delo Individ. work	ECTS
10					290	10

Nosilec predmeta / Lecturer:

Samo Kralj

Jeziki /

Languages:

Predavanja / slovenski/Slovenian

Lectures:

Vaje / Tutorial:

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

Predznanje iz klasične in moderne fizike.

Prerequisites:

Pre-knowledge of classical and modern.

Vsebina:

- 1) Statistični in fenomenološki opis narave.
- 2) Simetrija in fizikalni zakoni.

Content (Syllabus outline):

- 1) Modelling: macroscopic, mesoscopic, semi-microscopic models.

- 3) Kompleksni sistemi in mehka snov.
- 4) Povezave med kozmologijo, fiziko delcev in kondenzirano materijo.
- 5) Analogni pojavi v sociologiji in kondenzirani snovi.
- 6) Fizikalne ozadje modernega poučevanja.

- 2) Symmetry and physical laws.
- 3) Complex systems and soft materials.
- 4) Connections among particle physics, cosmology and condensed matter physics.
- 5) Analogous phenomena in condensed matter physics and sociology.
- 1) Physics and teaching approaches.

Temeljni literatura in viri / Readings:

- 1) J.C. Taylor, Hidden Unity in Natural Laws, Cambridge University Press, Cambridge, 2001.
- 2) M. Kleman, O.D. Lavrentovich, Soft Matter Physics, Springer-Verlag, New York, 2003.
- 3) P. M. Chaikin, T. C. Lubensky, Principles of Condensed Matter Physics, Cambridge University Press, Cambridge, 1995.
- 4) A. Leach, Molecular modelling: Principles and applications, Pearson, 2001.
- 5) D. Chandler, Introduction to modern statistical mechanics, Oxford University Press, Oxford, 1987.

Cilji in kompetence:

Študenti poglobijo znanje s področja analogij v moderni fiziki.

Objectives and competences:

Students acquire advanced knowledge on modeling in physics, analogies and universalities.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje ključnih procesov v naravi.

Prenesljive/ključne spretnosti in drugi atributi:

Univerzalnosti v fiziki in celosten pristop k reševanju problemov.

Intended learning outcomes:

Knowledge and understanding:

Understanding of key processes in nature.

Transferable/Key Skills and other attributes:

Universalities in physics and gained global approach on solving problems.

Metode poučevanja in učenja:

Predavanja in reševanje zastavljenih problemov.

Learning and teaching methods:

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	66.6%	Two seminars
Ustni izpit	33.3%	Oral exam

Reference nosilca / Lecturer's references:

- 1) S. Kralj, V. Popa-Nita, Random anisotropy nematic model: connection with experimental systems, Eur. Phys. J E 14, 115-125 (2004).
- 2) V. Popa-Nita, S. Kralj, Random anisotropy nematic model: nematic--non-nematic mixture, Phys. Rev. E 73, 041705 (2006).
- 3) S. Kralj, R. Rosso, E.G. Virga, Finite-size effects on order reconstruction around nematic defects, Phys. Rev. E 81, 021702 (2010).
- 4) S. Kralj, R. Rosso, E.G. Virga, Curvature control of valence on nematic shells. Soft matter 7, 670 (2011).
- 5) S. Kralj, G. Cordoyiannis, D. Jesenek, A. Zidansek, G. Lahajnar, N. Novak, H. Amenitsch, Z. Kutnjak, Dimensional crossover and scaling behavior of a smectic liquid crystal confined to controlled-pore glass matrices, Soft matter 8, 2460 (2012).