Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Reševanje problemov v fiziki**
Course title:	**Problem Solving in Physics**

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

Vrsta predmeta / Course type

Izbirni iz nabora Fizikalno - didaktični predmeti za modul Izobraževalne fizike 2, 3

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
5	5				290	10

Nosilec predmeta / Lecturer: **Marko Gosak**

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

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

Ni posebnih zahtev.

Prerequisits:

None.

Vsebina:

Predavanja:
- osnove psihologije mišljenja in reševanja problemov
- reševanje problemov v fiziki

Content (Syllabus outline):

Lectures:
- Psychological foundations of thinking and problem solving
- Problem solving in physics

- strategije reševanja problemov v fiziki - razvoj tehnik in spretnosti za reševanje problemov - zvrsti zastavljanja problemov - evaluacija problemov v fiziki - modeliranje v fiziki kot način reševanja problemov Seminar: - priprava, prezentacija in diskusija fizikalnih problemov - evaluacija fizikalnih problemov	- Strategies for solving physical problems - Development of problem solving skills - Spectrum in posing physics problems - Evaluation of physics problems - Modelling in physics as example of problem solving Seminar: - Preparation, presentation and discussion of physics problems - Evaluation of physics problems

Temeljni literatura in viri / Readings:

1. J. R. Anderson, Cognitive Psychology and Its Implications, Worth Publishers, 2005
2. R. E. Mayer, Thinking, Problem Solving, Cognition, Freeman and Co., New York, 1992
3. J. D. Bransford, B. S. Stein, The Ideal Problem Solver, Freeman and Co., New York, 1984
4. D. Scarl, How to Solve Problems: For Success in Freshman Physics, Engineering , and Beyond, Dosoris Prss, Glen Cove, New York 1993
5. Joseph Molitoris: The Physics Problem Solver (Problem Solvers Solution Guides), ISBN-10: 9780878915071

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je pridobiti si znanje za razumevanje mišljenjskih procesov, ki potekajo ob reševanju fizikalnih problemov. Cilj je natrenirati metode in strategije reševanja problemov. Študenti razvijejo sposobnosti za produkcijo in ocenjevanje novih fizikalnih problemov.	The goal of the course is to provide for an understanding of the cognitive process which take place in solving (physics) problems. Different methods and strategies of problem solving are trained. The students develop skills to create and evaluate physics problems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študenti usvojijo in poglobijo znanje o trenutnih znanstvenih raziskavah na področju mišljenja in reševanja problemov s stališča kognitivne psihologije. Usvojijo različne strategije za reševanje problemov in razumejo različne lastnosti in namene fizikalnih problemov. Prenesljive/ključne spretnosti in drugi atributi: Zmožnost kritičnega presojanja fizikalnih	Knowledge and understanding: The students gain and deepen their knowledge about the current scientific status how thinking and problem solving is explained by cognitive psychology. They know different strategies for problem solving and understand distinctive features of physical problems. Transferable/Key Skills and other attributes: Ability for a critical judgment of physical

problemov. Zmožnost ustvarjanja novih fizikalnih problemov za različne starostne stopnje.	problems. Ability to create physical problems, in particular with regard to the age of students.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, skupinsko delo, individualno delo	Lectures, seminars, group work, individual work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Projekt priprave in evaluacije fizikalnih problemov	**50 %**	Project of preparation and evaluation of physics problems
Ustni zagovor	**50 %**	Oral exam

Reference nosilca / Lecturer's references:

1. MARKOVIČ, Rene, GOSAK, Marko, MARHL, Marko. Broad-scale small-world network topology induces optimal synchronization of flexible oscillators. *Chaos, solitons and fractals*. [Print ed.], 2014, vol. 69, str. 14-21. http://dx.doi.org/10.1016/j.chaos.2014.08.008. [COBISS.SI-ID 20845576]

2. GOSAK, Marko, GUIBERT, Christelle, BILLAUD, Marie, ROUX, Etienne, MARHL, Marko. The influence of gap junction network complexity on pulmonary artery smooth muscle reactivity in normoxic and chronically hypoxic conditions. *Experimental physiology*, ISSN 0958-0670, 2014, vol. 99, no. 1, str. 272-285, doi: 10.1113/expphysiol.2013.074971. [COBISS.SI-ID 20068872]

3. GOSAK, Marko, MARKOVIČ, Rene, MARHL, Marko. The role of neural architecture and the speed of signal propagation in the process of synchronization of bursting neurons. *Physica. A*, ISSN 0378-4371. [Print ed.], 2012, vol. 391, no. 8, str. 2764-2770, ilustr., doi: 10.1016/j.physa.2011.12.027. [COBISS.SI-ID 18948872]

4. GOSAK, Marko, PERC, Matjaž, KRALJ, Samo. Stochastic resonance in a locally excited system of bistable oscillators. *The European physical journal. B, Condensed matter physics*, ISSN 1434-6028, 2011, vol. 80, no. 4, str. 519-528, graf. prikazi, doi: 10.1140/epjb/e2011-10573-8. [COBISS.SI-ID 18533640]

5. MARHL, Marko, GOSAK, Marko, PERC, Matjaž, ROUX, Etienne. Importance of cell variability for calcium signaling in rat airway myocytes. *Biophysical chemistry*, ISSN 0301-4622. [Print ed.], 2010, vol. 148, iss. 1/3, str. 42-50, doi: 10.1016/j.bpc.2010.02.006. [COBISS.SI-ID 14070550]