Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Informacijsko-komunikacijska tehnologija (IKT) v fiziki**
Course title:	**Information and Communication Technologies (ICT) in Physics**

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 modul Izobraževalna fizika

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
10	**5**				**165**	**6**

Nosilec predmeta / Lecturer: **Marjan Krašna**

Jeziki / Languages:		
	Predavanja / Lectures:	Slovenščina / Slovene
	Vaje / Tutorial:	Slovenščina / Slovene

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

Ni pogojev.

Prerequisits:

None.

Vsebina:

• Fizikalne osnove računalništva. Organizacija in arhitektura sodobnih računalniških sistemov. FI programska oprema.

• Področja in modeli uporabe informacijsko-komunikacijske tehnologije (IKT) pri pouku fizike.

• Teorija in praksa vključevanja IKT v fizikalni eksperiment.

Content (Syllabus outline):

• Physical bases if computing. Organisation and architecture of modern computing systems. Physics software.

• Fields and models of using Information and Communication Technologies (ICT) in Physics education.

• Theory and practice including ICT in physics experiment.

• Konceptualno poučevanje fizike - CoLoS. • Multimedijski sistemi v pouku fizike. Vizualizacija fizikalnih pojavov. • Izobraževalna omrežja. Internet in pouk fizike. Izobraževanje na daljavo. • Planiranje in strokovno ter didaktično vrednotenje uporabe informatike in računalnika pri pouku fizike.	• Connectional learning of physics - CoLoS. • Multimedia systems in physics education. Virtualization of physics phenomena. • Educational internet. Internet and physics education. Distance learning. • Planning and professional and didactic evaluation use of information science and computers in physics education.

Temeljni literatura in viri / Readings:

1) Allison Littlejohn, Chris Pegler, *Preparing for blended e-learning*, Routledge, Taylor & Francis Group, London & NY, 2007, 2011
2) Randy D. Garrison, *E-learning in the 21th century*, Routledge, Taylor & Francis Group, London & NY, 2003, 2011
3) Helen Beetham & Rhona Sharpe, *Rethinking pedagogy for a digital age: Designing for 21st century learning*, Routledge Taylor & Francis Group, London & NY, 2007, 2013
4) *Teaching and learning online: New models of learning for a connected World*, Routledge,Taylor & Francis Group, London & NY, 2014
5) Gerlič, I.: Didaktika pouka fizike v osnovni šoli. PEF MB, 1992.
6) Gerlič, I. Udir, V.: Problemski pouk fizike v osnovni šoli. Zavod RS za šolstvo, Ljubljana, 2006.
7) Gerlič, I.: Računalništvo v izobraževanju. Maribor: PEF Maribor, 1991.
8) Gerlič, I.: Sodobna informacijska tehnologija v izobraževanju. DZS, Ljubljana, 2000.
9) Učbeniki, priročniki, napotki za učitelje, medijska in računalniška programska oprema slovenskih in tujih založb. Revije: Physics Teacher, Physics Education,
10) Technology&Learning, Computers&Education, Educational Technology in slovenske fizikalne, računalniške ter didaktične revije.

Cilji in kompetence:	**Objectives and competences:**
Študent/ka: • Poglobi znanja o možnostih povezovanja informatike in računalništva s poukom fizike; • Poglobi znanja o pomembnejših poteh za analiziranje, izboljšanje in moderniziranje metod ter tehnik poučevanja fizike z IKT.	A student: • Deepens knowledge about possibilities of correlations between informatics and computer science and physics education; • Deepens knowledge about important ways for analysis, improvement and modernization methods and physics teaching with ICT.

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

Znanje in razumevanje: • Poglobljeno poznavanje in razumevanje didaktike fizike in računalništva. • Poglobljeno razumevanje raziskovanja fizikalno-didaktičnih procesov Prenesljive/ključne spretnosti in drugi atributi: • Sposobnost kritične uporabe znanstvenih in strokovnih spoznanj s področja didaktike fizike. • Sposobnost samostojnega raziskovanja. • Sposobnost jasnega informacijskega izražanja.	Knowledge and understanding: • Deeper knowledge and understanding of the subjects of didactics of physics and computer science. • Deeper understanding of research in physical and didactical processes. Transferable/Key Skills and other attributes: • Ability to critically use and apply scientific and professional findings from didactics of physics. • Ability of independent research. • Skills in the use of computers in connection to informatics

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja in seminar, ki bosta temeljila na obravnavi študijskih primerov, eksperimentalni demonstraciji in multimedijski predstavitvi	• Lectures and seminar that will be based on the case studies, experimental demonstration and multimedia presentation.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
• Projektna naloga	**40%**	• Project
• Ustni izpit	**60%**	• Oral examination

Reference nosilca / Lecturer's references:

1. SLAVINEC, Mitja, KLEMENČIČ, Eva, AMBROŽIČ, Milan, KRAŠNA, Marjan. Impact of nanoparticles on nematic ordering in square wells. *Advances in condensed matter physics*, ISSN 1687-8108, 2015, vol. 2015, art. ID 532745, str. 1-11, ilustr., doi: 10.1155/2015/532745. [COBISS.SI-ID21186312]

2. KRAŠNA, Marjan, BRATINA, Tomaž. E-learning materials for social science students. V: LAMANAUSKAS, Vincentas (ur.). *Philosophy of mind and cognitive modelling in education - 2014*, (Problems of education in the 21st century, ISSN 1822-7864, vol. 61). Siauliai: Scientific Methodological Center Scientia Educologica, 2014, str. 77-87, ilustr. [COBISS.SI-ID 20948232]

3. KRAŠNA, Marjan, BRATINA, Tomaž. Designing digital security course in educational sciences. *International journal of knowledge engineering and soft data paradigms*, ISSN 1755-3229. [Online ed.], 2012, vol. 3, no. 3-4, str. 280-293, doi: 10.1504/IJKESDP.2012.050723. [COBISS.SI-ID19686664]

4. KRAŠNA, Marjan, BRATINA, Tomaž, KAUČIČ, Branko. Smart e-testing : future trend of e-learning or gentle deviation. V: LAMANAUSKAS, Vincentas (ur.). *Philosophy of mind and cognitive*

modelling in education - 2012, (Problems of education in the 21st century, ISSN 1822-7864, vol. 46). Siauliai: Scientific Methodological Center Scientia Educologica, 2012, str. 85-92, ilustr. [COBISS.SI-ID 20433672]

5. JESENEK, Dalija, GERLIČ, Ivan, VIŠNIKAR, Anja, REPNIK, Robert, KRALJ, Samo. Thin nematic films : laboratory of physics for topological defects. V: REPNIK, Robert (ur.). *Proceedings od the 11th European Conference on Liquid Crystals, ECLC 2011, 6-11 February 2011, Maribor, Slovenia*, (Molecular crystals and liquid crystals, ISSN 1542-1406, vol. 553, no. 1, 2012). Philadelphia: Taylor and Francis, 2012, vol. 553, no. 1, str. 153-160, doi: 10.1080/15421406.2011.609461. [COBISS.SI-ID 25534503]

6. REPNIK, Robert, GERLIČ, Ivan. Liquid crystals and development of natural science competences. V: REPNIK, Robert (ur.). *Proceedings od the 11th European Conference on Liquid Crystals, ECLC 2011, 6-11 February 2011, Maribor, Slovenia*, (Molecular crystals and liquid crystals, ISSN 1542-1406, vol. 553, no. 1, 2012). Philadelphia: Taylor and Francis, 2012, vol. 553, no. 1, str. 168-174, doi: 10.1080/15421406.2011.609464. [COBISS.SI-ID 19420680]

7. REPNIK, Robert, CVETKO, Matej, GERLIČ, Ivan. Development of some natural science competences in undergraduate study by training visualization skills on subject liquid crystal phases and structures. V: *Proceedings of the 23rd International Liquid Crystal Conference (ILCC 2010)*, (Molecular Crystals and Liquid Crystals, ISSN 1542-1406, vol. 547; 1). Philadelphia: Taylor and Francis, 2011, vol. 547, no. 1, str. 249-254, doi: 10.1080/15421406.2011.572770. [COBISS.SI-ID 19419912]

8. MILFELNER, Maja, AMBROŽIČ, Milan, KRAŠNA, Marjan, CVETKO, Matej, ZIDANŠEK, Aleksander, REPNIK, Robert. Visualization of nematic director field with the RGB color system. V: REPNIK, Robert (ur.). *Proceedings od the 11th European Conference on Liquid Crystals, ECLC 2011, 6-11 February 2011, Maribor, Slovenia*, (Molecular crystals and liquid crystals, ISSN 1542-1406, vol. 553, no. 1, 2012). Philadelphia: Taylor and Francis, 2012, vol. 553, no. 1, str. 50-57, doi: 10.1080/15421406.2011.609370. [COBISS.SI-ID 18901000]