



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Razvoj medpredmetne povezave tehnike in fizike
Subject Title:	Development of cross-curricular connections of Engineering and Physics

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Tehnika – področje izobraževanja, 3. stopnja		2	zimski/poletni
		ali	
Education in Engineering, 3 rd cycle		3	poletni
		2	winter/summer
		or	
		3	summer

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
10	5				75	3

Nosilec predmeta / Lecturer:

dr. Robert Repnik

Jeziki /

Languages:

Predavanja / Lecture: Slovenščina / Slovenian

Vaje / Tutorial:

Pogoji za opravljanje študijskih obveznosti:

Pogojev ni.
Priporočeno je osnovno znanje računalništva.

Prerequisites:

None.
Basic knowledge of computer science is recommended.

Vsebina:

Vsebina:

1. Pregled fizikalnih vsebin v učnih načrtih fizike v osnovni in srednji šoli.
2. Dnevi dejavnosti ter strokovne ekskurzije v šoli s poudarkom na medpredmetnem povezovanju fizike in tehnike.
3. Raziskovalna orodja za spremljanje razvoja kvalitete in kvantitete medpredmetne povezave fizike in tehnike.
4. Poznavanje primerov dobre prakse medpredmetnega povezovanja fizike, astronomije in tehnike v osnovni in srednji šoli.
6. Načrtovanje in izvedba raziskave na področju razvoja medpredmetnega povezovanja fizike, astronomije in tehnike v osnovni ali srednji šoli.

Content (Syllabus outline):

Contents:

1. Overview of physics content in the curriculum of physics in primary and secondary school.
2. Days of special activities and school excursions with an emphasis on cross-curricular connections of physics and engineering.
3. Research tools for monitoring development in the quality and quantity of cross-curricular connections of physics and technology.
4. Examples of good practice of cross-curricular connections in teaching physics, astronomy and engineering in primary and secondary school.
6. Design and execution of research in the development of cross-curricular connections in teaching physics, astronomy and technology in primary or secondary school.

Temeljni literatura in viri / Textbooks:

Burton, Diana, Bartlett, Steve. Key issues for education researchers, Sage Publications Ltd., London UK, 2009

Fraenkel, Jack r., Wallen, Norman E., Hyun, Hellen H.. How to design and evaluate Research in Education, McGraw-Hill Companies Inc., New York, USA, 2012

Newby, Peter. Research Methods for Education, Pearson Education Ltd., Harlow, Essex, UK, 2010

Cohen, L., Manion, L. in Morrison, K. (2005). *Research methods in Education* (5th ed.). London, New York: RoutledgeFalmer.

Čagran, B. (2004). *Univariatna in multivariatna analiza podatkov: zbirka primerov uporabe statističnih metod s SPSS*. Maribor: Pedagoška fakulteta.

Aktualni učni načrti za fiziko, oziroma za predmete z vključenimi fizikalnimi vsebinami v osnovni in srednji šoli.

Aktualni učni načrti za tehniko, oziroma za predmete z vključenimi tehniškimi vsebinami v osnovni in srednji šoli.

Na spletnih straneh Oddelka za fiziko in Oddelka za tehniko objavljena elektronska gradiva / teaching material published on websites of Department of Physics

Literatura in spletni viri projekta Razvoj naravoslovnih kompetenc

Spletni viri o aktualnih in zaključenih raziskavah in projektih s področja izobraževanja fizike v Sloveniji in EU, predvsem s področja medpredmetnih povezav.

Znanstvene in strokovne revije relevantnih področij.

Slovenski in tuji elektronski in tiskani visokošolski učbeniki za fiziko in tehniko ter predmete z vključenimi fizikalnimi in/ali tehniškimi vsebinami v osnovni in srednji šoli.

Cilji:

Študent pozna učne načrte fizike in tehnike ter razume namen medpredmetnega povezovanja in ga vključuje v organizacijo pedagoškega procesa ter načrtovanje raziskav.

Objectives:

Student acquires detailed knowledge of the curriculum of physics and engineering, understands the purpose of interdisciplinary teaching of physics and engineering and implement it in the organization of pedagogical process and planning research.

Predvideni študijski rezultati:Znanje in razumevanje:Po uspešno zaključeni učni enoti študent:

- - pozna učne načrte fizike in tehnike ter predmetov z vključenimi fizikalnimi in/ali tehniškimi vsebinami v osnovni in srednji šoli,
- razume namen in cilje medpredmetnega povezovanja fizike in tehnike,
- uporablja raziskovalne metode v izobraževanju za spremljanje razvoja kvalitete in kvantitete medpredmetne povezave fizike in tehnike.

Prenesljive/ključne spretnosti in drugi atributi:Študent:

- pridobi sposobnost analize informacij in sinteze zaključkov na podlagi primerjave učnih načrtov fizike in tehnike,

Intended learning outcomes:Knowledge and understanding:On completion of this course student:

- has knowledge about the curriculum of physics and engineering and subjects with included physical and / or engineering content in primary and secondary school, understands the purpose and goals of cross-curricular connections in physics and engineering.
- uses research methods in education for monitoring the development of quality and quantity of cross-curricular connections in physics and technology.

Transferable/Key Skills and other attributes:Student:

- acquires ability to analyse information and synthesize conclusions on the basis of a comparison of curriculum in physics and engineering.

- razvija sistematično in analitično razmišljanje na podlagi poznavanja raziskav in dobrih praks.
- razvija sposobnost izbire in uporabe ustreznih raziskovalnih metod na različnih področjih.
- se uri v načrtovanju in uporabi kompetenc, potrebne za prenos znanstvenih dognanj v pouk (fizike in tehnike).
- pridobi sposobnost oblikovanja medpredmetnih povezav pri pouku, dnevnih dejavnosti in strokovnih ekskurzijah.

- develops systematic and analytical thinking on the basis of knowledge of research results and best practices.
- acquires ability to select and to apply appropriate research methods in different areas.
- train in designing and implementation of the competences needed to transfer scientific discoveries into teaching (physics and technology).
- Acquires ability to design cross-curricular connections in the classroom, the days of special activities and excursions.

Metode poučevanja in učenja:

predavanja (razlaga, razgovor), izdelava in predstavitev seminarske naloge, diskusije v elektronskem forumu, e-učenje, individualizacija poučevanja, elementi obrnjenega poučevanja.

Poučevanje in učenje potekata z didaktično uporabo informacijsko-komunikacijske tehnologije.

Teaching and learning methods:

lectures (explanation, discussion), seminar work (work and presentation), discussion in electronic forums, e-learning, individualization in teaching, elements of flipped learning

Teaching and learning are done through the didactic use of ICT.

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):
diskusije v elektronskem forumu, seminarska naloga (izdelek in predstavitev), ustni izpit.

Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.

Pozitivna ocena diskusij v elektronskem forumu in seminarske naloge sta pogoj za pristop k ustnemu izpitu.

Delež (v %) /
Weight (in %)

Assessment methods:

Type (examination, oral, coursework, project):

10 %
30 %
60 %
discussion in electronic forums, seminar work (work and presentation), oral exam.

Each of the mentioned commitments must be assessed with a passing grade.

Positive grade of discussion in electronic forms and positive grade of seminar work are a prerequisite for access to the oral exam.

Reference nosilca / Lecturer's references:

JOZIČ, Primož, ZIDANŠEK, Aleksander, REPNIK, Robert. Fuel conservation for launch vehicles: Falcon Heavy case study. *Energies*. 2020, vol. 13, no. 3, str. 1-10. ISSN 1996-1073. DOI: 10.3390/en13030660. [COBISS.SI-ID 25125640], [JCR, SNIP], financer: ARRS, Programi, P2-0348, SI, Nove slikovno-analitske metode; ARRS, Programi, P1-0403, SI, Računsko intenzivni kompleksni sistemi; Projekt Inovativno učenje in poučevanje v visokem šolstvu (INOUP)

REPNIK, Robert. Flood protection with modelling of river flow. V: CELEC, Robert (ur.). *Transfer of studies regarding environmental problems to the field of economy through education*. Hamburg: Dr. Kovač, 2018. Str. 135-144, graf. prikazi. *Schriftenreihe Erziehung - Unterricht - Bildung*, Band 188. ISBN 978-3-339-10272-0. ISSN 0945-487X. [COBISS.SI-ID 24326920]

REPNIK, Robert, ARCET, Robi, KARASEL, Nedime. Education of teachers in the field of teaching natural science is lagging behind the requirements of the inclusion of pupils with special needs. *International journal of disability, development and education*. 2019, vol. 66, no. 6, str. 565-576. ISSN 1034-912X. DOI: 10.1080/1034912X.2019.1642456. [COBISS.SI-ID 24749064], [JCR, SNIP]

KLEMENČIČ, Eva, FOŠNARIČ, Samo, REPNIK, Robert. The use of sources in elementary school and high school education. V: CELEC, Robert (ur.). *Some current elements of health awareness through the prism of food, exercise and education*. Hamburg: Verlag Dr. Kovač, 2020. Str. 85-97, ilustr., tabele. Erziehung - Unterricht - Bildung, Bd. 195. ISBN 978-3-339-11368-9, ISBN 978-3-339-11369-6. ISSN 0945-487X. [COBISS.SI-ID [25112328](#)]

REPNIK, Robert, RANJKESH SIAHKAL, Amid, ŠIMONKA, Vito, AMBROŽIČ, Milan, BRADAČ, Zlatko, KRALJ, Samo. Symmetry breaking in nematic liquid crystals: analogy with cosmology and magnetism. *Journal of physics, Condensed matter*, ISSN 0953-8984, 2013, vol. 25, no. 40, str. 404201-1-404201-10, doi: [10.1088/0953-8984/25/40/404201](https://doi.org/10.1088/0953-8984/25/40/404201). [COBISS.SI-ID [20050952](#)], [JCR, SNIP, WoS do 18. 6. 2014: št. citatov (TC): 1, čistih citatov (CI): 1, normirano št. čistih citatov (NC): 0, Scopus do 28. 11. 2014: št. citatov (TC): 2, čistih citatov (CI): 1, normirano št. čistih citatov (NC): 0]