



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Uvod v znanstvenoraziskovalno delo
Course title:	Introduction to Scientific Research

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

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	5				75	3

Nosilec predmeta / Lecturer:

Jeziki / Languages:	Predavanja / Lectures:	<input type="text" value="Slovenski / Slovenian"/>
	Vaje / Tutorial:	<input type="text" value="Slovenski / Slovenian"/>

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
<input type="text" value="Ni pogojev."/>	<input type="text" value="None."/>

Vsebina:	Content (Syllabus outline):
<ul style="list-style-type: none">- Metode znanstvenoraziskovalnega dela v fiziki- Struktura znanstvenega članka (formuliranje problema, metode raziskovanja, prikaz rezultatov, primerjava in ovrednotenje rezultatov, diskusija, povzetek raziskave, ugotovitve).- Načini in pravila predstavitve rezultatov znanstvenoraziskovalnega dela v obliki konferenčnih prispevkov, člankov v znanstvenih revijah, patentov, dizertacije.	<ul style="list-style-type: none">- Methods of scientific research in physics- The structure of scientific paper (problem formulation, research methods, presentation of results, comparison and evaluation of the results, discussion, summary and abstract).- Methods and rules for oral presentations at conferences, in form of papers in scientific journals, patents, theses.- Quality of journals: JCR, impact factor (IF), the criteria in the UM, the criteria on the FNM.

- Kvaliteta objav: JCR, faktor vpliva (IF), kriteriji na UM, kriteriji na FNM.
- Raziskovalni kodeks, avtorstvo, raziskovalna poštenost in etični vidiki raziskovanja ter plagiatstvo.
- Odnos doktorski študent - mentor, pravice in dolžnosti študenta in mentorja, postopek in pogoji za pridobitev doktorata znanosti na UM

- Research code, authorship, research integrity and ethical aspects of research and plagiarism.
- Relationship PhD student - mentor, rights and duties of a student, the procedure and conditions for obtaining a doctorate at UM.

Temeljni literatura in viri / Readings:

Day, R. A. (1995). *Scientific English: A guide for scientists and other professionals*. Oryx Press.
<https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/2867994>

Day, R. A. (2006). *How to write and publish a scientific paper*. Greenwood Press.
<https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/14788616>

Alley, M. (2005). *The craft of scientific presentations: Critical steps to succeed and critical errors to avoid*. Springer. <https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/2867994>

4. Akti in pravilniki o doktorskem študiju na Fakulteti za naravoslovje in matematiko Univerze v Mariboru

- Znanstveni članki v revijah s področja izbire raziskovalne tematike v seminarju. / Scientific papers in periodicals chosen for the seminar.
- Akti in pravilniki o doktorskem študiju na FNM UM.
- Akti in poročila Javne agencije za raziskovalno dejavnost Republike Slovenije (ARRS).

Cilji in kompetence:

Glavni cilj je študenta naučiti, katere so metode znanstvenoraziskovalnega dela, ki jih bodo morali uporabljati pri izdelavi doktorske disertacije in pri objavi znanstvenega članka. Študent mora znati definirati problem in se ga lotiti s primerno raziskovalno metodo, znati predstaviti rezultate raziskave ter jih kritično primerjati, diskutirati in zagovarjati.

Objectives and competences:

The main objective is to enable students to learn which methods of scientific research will be used within the doctoral thesis and the scientific article. The student must be able to define the problem and tackle it with the appropriate research method, to present the results of research and to critically compare, discuss and defend them.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- izkazati znanje in razumevanje elementarnih znanstvenoraziskovalnih metod s področja fizike,
- razumeti pomen objavljavanja raziskovalnih dosežkov,

Intended learning outcomes:

Knowledge and understanding:

On completion of this course the student will be able to:

- demonstrate knowledge and understanding of elementary scientific research methods from physics
- understanding importance of publishing and presenting scientific achievements,

- izkazati razumevanje različnih znanstvenih virov,
- razlikovati med vrstami znanstvenih objav,
- izkazati znanje in razumevanje raziskovalne etike,
- prepoznati plagijatorstvo,
- izkazati znanje in razumevanje, potrebno pri oblikovanju doktorskih tez, pri strukturiranju doktorske disertacije in pri njenem zagovoru,
- izkazati poznavanje osnovnih strategij v komunikaciji s končnim uporabnikom raziskav.

Prenesljive/ključne spretnosti in drugi atributi:

- strokovno zapisovanje in izražanje fizikalnih vsebin
- suvereno predstavljanje ključnih spoznanj in spretnost argumentiranja

- distinguish between different scientific sources,
- demonstrate understanding of research ethics,
- recognise plagiarism,
- demonstrate knowledge and understanding needed at expressing hypotheses, structuring and defending PhD thesis,
- Understanding basic approaches in communication with end user of research results.

Transferable/Key Skills and other attributes:

- expressing physical contents in oral and written form
- clear presentation of the results of research work and efficient argumentation

Metode poučevanja in učenja:

Predavanja
Seminarsko delo
Samostojno delo

Learning and teaching methods:

Lectures
Project work
Individual work

Načini ocenjevanja:

Ustni izpit
Seminarska naloga

Delež (v %) /

Weight (in %)

Assessment:

Oral exam
Seminar paper

Opomba: Se oceni z opravi / ni opravi. Pass / fail evaluation.

Reference nosilca / Lecturer's references:

EMERŠIČ, Tadej, ZHANG, Rui, KOS, Žiga, ČOPAR, Simon, OSTERMAN, Natan, PABLO, Juan J. de, TKALEC, Uroš. Sculpting stable structures in pure liquids. *Science advances*, ISSN 2375-2548, Feb. 2019, vol. 5, art. no. eaav4283, 8 str., ilustr., doi: [10.1126/sciadv.aav4283](https://doi.org/10.1126/sciadv.aav4283). [COBISS.SI-ID 3291748]

KIM, Dae Seok, ČOPAR, Simon, TKALEC, Uroš, YOON, Dong Ki. Mosaics of topological defects in micro-patterned liquid crystal textures. *Science advances*, ISSN 2375-2548, Nov. 2018, vol. 4, art. no. eaau8064, 8 str., ilustr., doi: [10.1126/sciadv.aau8064](https://doi.org/10.1126/sciadv.aau8064). [COBISS.SI-ID 3267684]

ČOPAR, Simon, TKALEC, Uroš, MUŠEVIČ, Igor, ŽUMER, Slobodan. Knot theory realizations in nematic colloids. *Proceedings of the National Academy of Sciences of the United States of America*, ISSN 0027-8424, 2015, vol. 112, no. 6, str. 1675-1680, ilustr. <http://www.pnas.org/content/112/6/1675.full.pdf+html>. [COBISS.SI-ID 2787940]

SENGUPTA, Anupam, TKALEC, Uroš, RAVNIK, Miha, YEOMANS, Julia M., BAHR, Christian, HERMINGHAUS, Stephan. Liquid crystal microfluidics for tunable flow shaping. *Physical review letters*, ISSN 0031-9007. [Print ed.], 2013, vol. 110, iss. 4, str. 048303-1-048303-5. <http://prl.aps.org/abstract/PRL/v110/i4/e048303>. [COBISS.SI-ID [2528868](#)]

TKALEC, Uroš, MUŠEVIČ, Igor. Topology of nematic liquid crystal colloids confined to two dimensions. *Soft matter*, ISSN 1744-683X, 2013, vol. 9, issue 34, str. 8140-8150, doi: [10.1039/C3SM50713K](https://doi.org/10.1039/C3SM50713K). [COBISS.SI-ID [26755367](#)]