



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Računsko družboslovje</b>
<b>Course title:</b>	<b>Computational social science</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA, 3. stopnja		1. ali 2.	1., 2. ali 4.
PHYSICS, 3 <sup>rd</sup> cycle		1. or 2.	1., 2. or 4.

**Vrsta predmeta / Course type**

Izbirni za vse module

**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
15					165	6

**Nosilec predmeta / Lecturer:**

Matjaž Perc

**Jeziki /**

**Languages:**

**Predavanja /**

**Lectures:**

Slovenski / Slovene

**Vaje / Tutorial:** Slovenski / Slovene

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

Ni pogojev.

**Prerequisites:**

None.

**Vsebina:**

Osnove teorije iger, fizikalna interpretacija Darwinovega zakona evolucije, uspešnost različnih vedenjskih vzorcev v luči fizike.

**Content (Syllabus outline):**

Basics of game theory, physical interpretation of the Darwinian law of evolution, successfulness of different behavioural patterns in terms of physics.

**Temeljni literatura in viri / Readings:**

- 1) K. Sigmund, *Games of life* (Oxford University Press, Oxford, 1993).
- 2) R. Axelrod, *The evolution of cooperation* (Basic Books, New York, 1984).

- 3) J. Hofbauer and K. Sigmund, *Evolutionary games and population dynamics* (Cambridge University Press, Cambridge, 1998).
- 4) M. Perc, The Matthew effect in empirical data, *J. R. Soc. Interface* 11, 20140378 (2014)
- 5) M. Perc and P. Grigolini, Collective behavior and evolutionary games - An introduction, *Chaos, Solitons & Fractals* 56, 1-5 (2013)
- 6) D. Helbing, et al., Saving human lives: What complexity science and information systems can contribute, *J. Stat. Phys.* (2015) DOI: 10.1007/s10955-014-1024-9

**Cilji in kompetence:**

Podati znanje o vedenjskih strategijah in razumeti njihov uspeh (ali neuspeh) na podlagi fizike.

**Objectives and competences:**

Deliver knowledge about behavioural patterns and understand their success (or failure), in view of the underlying mechanisms of physics.

**Predvideni študijski rezultati:**

Znanje in razumevanje:

Poglobljeno razumevanje učinkov in potencialov različnih vedenjskih vzorcev v družbi.

Prenosljive/ključne spretnosti in drugi atributi:

Sposobnost prepoznati in analizirati različne vedenjske vzorce in strategije ter predvideti njihov vpliv na družbo (ali skupino ljudi), ki jim je podvržena.

**Intended learning outcomes:**

Knowledge and understanding:

A deeper understanding of effect and potentials of different behavioural patterns in society.

Transferable/Key Skills and other attributes:

The ability to recognize and analyse different behavioural patterns and strategies, and foretell their impact on the affected society (or group of people).

**Metode poučevanja in učenja:**

Predavanja in projektno delo.

**Learning and teaching methods:**

Lectures and project work.

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Ustni izpit	<b>50%</b>	Oral exam
Opravljeno projektno delo	<b>50%</b>	Done project work

**Reference nosilca / Lecturer's references:**

1. QIN, Jiahu, CHEN, Yaming, KANG, Yu, PERC, Matjaž. Social diversity promotes cooperation in spatial multigames. *Europhysics letters*, ISSN 0295-5075, 2017, vol. 118, no. 1, str. 18002-p1-18002-p7, doi: [10.1209/0295-5075/118/18002](https://doi.org/10.1209/0295-5075/118/18002). [COBISS.SI-ID [23135752](https://www.cobiss.si/id/23135752)]
2. AMARAL, Marco A., PERC, Matjaž, WARDIL, Lucas, SZOLNOKI, Attila, SILVA JÚNIOR, Elton J. da, SILVA, Jafferson K. L. da. Role-separating ordering in social dilemmas controlled by topological

frustration. *Physical review. E*, ISSN 2470-0045, 2017, vol. 95, iss. 3, str. 032307-1-032307-9, doi: [10.1103/PhysRevE.95.032307](https://doi.org/10.1103/PhysRevE.95.032307). [COBISS.SI-ID [23012616](#)]

**3.** JALILI, Mahdi, OROUSKHANI, Yasin, ASGARI, Milad, ALIPOURFARD, Nazanin, PERC, Matjaž. Link prediction in multiplex online social networks. *Royal Society Open Science*, 2017, vol. 4, iss. 2, str. 1-11, doi: [10.1098/rsos.160863](https://doi.org/10.1098/rsos.160863). [COBISS.SI-ID [22983432](#)]

**4.** SZOLNOKI, Attila, PERC, Matjaž. Collective influence in evolutionary social dilemmas. *Europhysics letters*, ISSN 0295-5075, 2016, vol. 113, no. 5, str. 58004-p1-58004-p6, doi: [10.1209/0295-5075/113/58004](https://doi.org/10.1209/0295-5075/113/58004). [COBISS.SI-ID [22091784](#)]

**5.** FISTER, Iztok, FISTER, Iztok, PERC, Matjaž. Toward the discovery of citation cartels in citation networks. *Frontiers in physics*, ISSN 2296-424X, 2016, vol. 4, art. no. 49, str. 1-5, doi: [10.3389/fphy.2016.00049](https://doi.org/10.3389/fphy.2016.00049). [COBISS.SI-ID [22865928](#)]

1. [Grand challenges in social physics: In pursuit of moral behavior](#), Valerio Capraro and Matjaž Perc, *Front. Phys.* **6**, 107 (2018)
2. [Information cascades in complex networks](#), Mahdi Jalili and Matjaž Perc, *J. Complex Netw.* **5**, 665-693 (2017)
3. [Computational intelligence in sports: Challenges and opportunities within a new research domain](#), Iztok Fister Jr., Karin Ljubič, Ponnuthurai Nagaratnam Suganthan, Matjaž Perc, and Iztok Fister, *Appl. Math. Comput.* **262**, 178-186 (2015)