



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Fizika družbe</b>
<b>Course title:</b>	<b>Social physics</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:**

Teorija iger, fizikalna interpretacija Darwinovega zakona evolucije, uspešnost različnih vedenjskih vzorcev v luči fizike, vpliv vedenjskih vzorcev na uspešnost družbe kot celote, nastanek kompleksnih mrež in pojav malega sveta.

**Content (Syllabus outline):**

Game theory, physical interpretation of the Darwinian law of evolution, successfulness of different behavioural patterns in terms of physics, impacts of different behavioural patterns on the prosperity of society as a whole, emergence of complex networks and the small-world phenomenon.

## 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) A. Szolnoki, et al., Cyclic dominance in evolutionary games: A review, *J. R. Soc. Interface* 11, 20140735 (2014)
- 5) M. Perc and P. Grigolini, Collective behavior and evolutionary games - An introduction, *Chaos, Solitons & Fractals* 56, 1-5 (2013)
- 6) M. Perc and A. Szolnoki, Coevolutionary games - A mini review, *BioSystems* 99, 109-125 (2010)

### Cilji in kompetence:

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

### Objectives and competences:

Deliver knowledge about behavioural patterns in society 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:

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

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.

### Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

Ustni izpit

Opravljeno projektno delo

Delež (v %) /

Weight (in %)

### Assessment:

Type (examination, oral, coursework, project):

Oral exam

Done project work

### Reference nosilca / Lecturer's references:

1. SZOLNOKI, Attila, PERC, Matjaž. Competition of tolerant strategies in the spatial public goods game. *New journal of physics*, ISSN 1367-2630. [Online ed.], Aug. 2016, vol. 18, str. 083021-1-083021-11, doi: [10.1088/1367-2630/18/8/083021](https://doi.org/10.1088/1367-2630/18/8/083021). [COBISS.SI-ID [22452232](#)]
2. HELBING, Dirk, BROCKMANN, Dirk, CHADEFAY, Thomas, DONNAY, Karsten, BLANKE, Ulf, WOOLLEY-MEZA, Olivia, MOUSSAID, Mehdi, JOHANSSON, Anders, KRAUSE, Jens, SCHUTTE, Sebastian, PERC, Matjaž. Saving human lives : what complexity science and information systems can contribute. *Journal of statistical physics*, ISSN 0022-4715, 2015, vol. 158, iss. 3, str. 735-781, doi: [10.1007/s10955-014-1024-9](https://doi.org/10.1007/s10955-014-1024-9). [COBISS.SI-ID [21182728](#)], [JCR, SNIP, WoS do 12. 5. 2019: št. citatov (TC): 104, čistih citatov (CI): 100, Scopus do 28. 5. 2019: št. citatov (TC): 128, čistih citatov (CI): 124]
3. WANG, Zhen, BAUCH, Chris T., BHATTACHARYYA, Samit, D'ONOFRIO, Alberto, MANFREDI, Piero, PERC, Matjaž, PERRA, Nicola, SALATHÉ, Marcel, ZHAO, Dawei. Statistical physics of vaccination. *Physics reports*, ISSN 0370-1573. [Print ed.], Dec. 2016, vol. 664, str. 1-113, ilustr., doi: [10.1016/j.physrep.2016.10.006](https://doi.org/10.1016/j.physrep.2016.10.006). [COBISS.SI-ID [22848520](#)], [JCR, SNIP, WoS do 12. 5. 2019: št. citatov (TC): 267, čistih citatov (CI): 253, Scopus do 29. 5. 2019: št. citatov (TC): 292, čistih citatov (CI): 276]
4. PERC, Matjaž, JORDAN, Jillian J., RAND, David G., WANG, Zhen, BOCCALETTI, Stefano, SZOLNOKI, Attila. Statistical physics of human cooperation. *Physics reports*, ISSN 0370-1573. [Print ed.], 2017, vol. 687, str. 1-51, ilustr., doi: [10.1016/j.physrep.2017.05.004](https://doi.org/10.1016/j.physrep.2017.05.004). [COBISS.SI-ID [23279112](#)], [JCR, SNIP, WoS do 12. 5. 2019: št. citatov (TC): 246, čistih citatov (CI): 227, Scopus do 7. 6. 2019: št. citatov (TC): 264, čistih citatov (CI): 242]
5. PERC, Matjaž. Phase transitions in models of human cooperation. *Physics letters. Section A*, ISSN 0375-9601. [Print ed.], 2016, vol. 380, iss. 36, str. 2803-2808, doi: [10.1016/j.physleta.2016.06.017](https://doi.org/10.1016/j.physleta.2016.06.017). [COBISS.SI-ID [22452744](#)]