



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Sociofizika</b>
<b>Course title:</b>	<b>Sociophysics</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	1., 2. ali 3.
PHYSICS		1. or 2.	1., 2. or 3.

**Vrsta predmeta / Course type**

Izbirni za module Izobraževalna fizika 1, 2, Biofizika 3, Fizika 1, 2, 3

**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
5					145	5

**Nosilec predmeta / Lecturer:**

**Matjaž Perc**

**Jeziki /**

**Languages:**

**Predavanja /**

**Lectures:**

slovenski/Slovenian

**Vaje / Tutorial:**

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

Osnovno razumevanje načel evolucije in poznavanje osnov modeliranja.

**Prerequisites:**

Basic understanding of principles of evolution and familiarity with basics of modelling.

**Vsebina:**

**Content (Syllabus outline):**

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.

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:

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

### Objectives and competences:

Deepen the 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.

Prenesljive/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 individualno raziskovalno delo.

### Learning and teaching methods:

Lectures individual research work.

**Načini ocenjevanja:****Weight (in %)****Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt)	Weight (in %)	Type (examination, oral, coursework, project):
Ustni izpit	<b>80%</b>	Oral exam
Seminarska naloga	<b>20%</b>	Written seminar work

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

1. KOSTIĆ, Srđan, VASOVIĆ, Nebojša, PERC, Matjaž. Temporal distribution of recorded magnitudes in Serbia earthquake catalog. *Applied mathematics and computation*, ISSN 0096-3003. [Print ed.], 2014, vol. 244, str. 917-924, doi: [10.1016/j.amc.2014.07.063](https://doi.org/10.1016/j.amc.2014.07.063). [COBISS.SI-ID [20805896](#)]
2. WANG, Zhen, SZOLNOKI, Attila, PERC, Matjaž. Rewarding evolutionary fitness with links between populations promotes cooperation. *Journal of theoretical biology*, ISSN 0022-5193, 2014, vol. 349, str. 50-56, doi: [10.1016/j.jtbi.2014.01.037](https://doi.org/10.1016/j.jtbi.2014.01.037). [COBISS.SI-ID [20361480](#)]
3. TRENCHARD, Hugh, RICHARDSON, Ashlin, RATAMERO, Erick, PERC, Matjaž. Collective behavior and the identification of phases in bicycle pelotons. *Physica. A*, ISSN 0378-4371. [Print ed.], 2014, vol. 405, str. 92-103, doi: [10.1016/j.physa.2014.03.002](https://doi.org/10.1016/j.physa.2014.03.002). [COBISS.SI-ID [20443912](#)]
4. SZOLNOKI, Attila, PERC, Matjaž. Evolution of extortion in structured populations. *Physical review. E, Statistical, nonlinear, and soft matter physics*, ISSN 1539-3755, 2014, vol. 89, iss. 2, str. 022804-1-022804-5, doi: [10.1103/PhysRevE.89.022804](https://doi.org/10.1103/PhysRevE.89.022804). [COBISS.SI-ID [20361224](#)]
5. SZOLNOKI, Attila, PERC, Matjaž, MOBILIA, Mauro. Facilitators on networks reveal optimal interplay between information exchange and reciprocity. *Physical review. E, Statistical, nonlinear, and soft matter physics*, ISSN 1539-3755, 2014, vol. 89, iss. 4, str. 042802-1-042802-8, doi: [10.1103/PhysRevE.89.042802](https://doi.org/10.1103/PhysRevE.89.042802). [COBISS.SI-ID [20467720](#)]