



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Fizika družbenih sistemov
Course title:	Physics of social systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	1., 2. ali 4.
PHYSICS		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:

Osnovno razumevanje načel evolucije in poznavanje osnov modeliranja.

Prerequisites:

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

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:

Poglobiti 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.

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 individualno raziskovalno delo.

Learning and teaching methods:

Lectures individual research work.

Načini ocenjevanja:

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

Ustni izpit

Seminarska naloga

Delež (v %) /

Weight (in %)

Assessment:

Type (examination, oral, coursework, project):

Oral exam

Written seminar 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. AMARAL, Marco A., WARDIL, Lucas, PERC, Matjaž, SILVA, Jafferson K. L. da. Evolutionary mixed games in structured populations : cooperation and the benefits of heterogeneity. *Physical review. E*, ISSN 2470-0045, 2016, vol. 93, iss. 4, str. 042304-1-042304-8, doi: [10.1103/PhysRevE.93.042304](https://doi.org/10.1103/PhysRevE.93.042304). [COBISS.SI-ID [22112264](#)]
3. AMARAL, Marco A., WARDIL, Lucas, PERC, Matjaž, SILVA, Jafferson K. L. da. Stochastic win-stay-lose-shift strategy with dynamic aspirations in evolutionary social dilemmas. *Physical review. E*, ISSN 2470-0045, 2016, vol. 94, iss. 3, str. 032317-1-032317-9, doi: [10.1103/PhysRevE.94.032317](https://doi.org/10.1103/PhysRevE.94.032317). [COBISS.SI-ID [22667528](#)]
4. ALETA, Alberto, MELONI, Sandro, PERC, Matjaž, MORENO, Yamir. From degree-correlated to payoff-correlated activity for an optimal resolution of social dilemmas. *Physical review. E*, ISSN 2470-0045, 2016, vol. 94, iss. 6, str. 062315-1-062315-8, doi: [10.1103/PhysRevE.94.062315](https://doi.org/10.1103/PhysRevE.94.062315). [COBISS.SI-ID [22875912](#)]
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](#)]