



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Vedenjske strategije in igre v fiziki
Course title:	Behavioural strategies and games in physics

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 / slovenski/Slovenian

Lectures:

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:

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:

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

Objectives and competences:

Deepen the 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.

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:

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 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 %)

80%

20%

Assessment:

Type (examination, oral, coursework, project):

Oral exam

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. SZOLNOKI, Attila, ANTONIONI, Alberto, TOMASSINI, Marco, PERC, Matjaž. Binary birth-death dynamics and the expansion of cooperation by means of self-organized growth. *Europhysics letters*, ISSN 0295-5075, 2014, vol. 105, no. 4, str. 48001-p1-48001-p6, doi: [10.1209/0295-5075/105/48001](https://doi.org/10.1209/0295-5075/105/48001). [COBISS.SI-ID [20401416](#)]

3. 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](#)]

4. CHEN, Xiaojie, SZOLNOKI, Attila, PERC, Matjaž. Probabilistic sharing solves the problem of costly punishment. *New journal of physics*, ISSN 1367-2630. [Online ed.], 2014, vol. 16, iss. 8, str. 083016-1-083016-14, doi: [10.1088/1367-2630/16/8/083016](https://doi.org/10.1088/1367-2630/16/8/083016). [COBISS.SI-ID [20806152](#)]

5. 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](#)]