

UČNI NAČRT PREDMETA / COURSE SYLLABUS

| | |
|----------------------|-----------------------|
| Predmet: | Analiza časovnih vrst |
| Course title: | Time series analysis |

| Študijski program in stopnja Study programme and level | Študijska smer Study field | Letnik Academic year | Semester Semester |
|---|-------------------------------|-------------------------|----------------------|
| Fizika 2. st. | | 2 | 3 |
| Physics 2 nd degree | | 2 | 3 |

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

| Predavanja Lectures | Seminar Seminar | Vaje Tutorial | Klinične vaje work | Druge oblike študija | Samost. delo Individ. work | ECTS |
|------------------------|--------------------|------------------|-----------------------|-------------------------|-------------------------------|------|
| 45 | 0 | 15 | 0 | 0 | 90 | 5 |

Nosilec predmeta / Lecturer:

| | | |
|--------------------------------|-----------------------------------|---|
| Jeziki / Languages: | Predavanja / Lectures: | Slovenski/Slovenian in/and angleški/English |
| | Vaje / Tutorial: | Slovenski/Slovenian in/and angleški/English |

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

Osnove teorije dinamičnih sistemov in rogramiranja v poljubnem jeziku.

Prerequisites:

Basic knowledge of dynamical system's theory and programming skills in an arbitrary language.

Vsebina:

Linearne metode in splošna terminologija, Nelinearne metode, Meritve realnih sistemov in šum, Koncept - vsa informacija je v eni spremenljivki, Rekonstrukcija faznega prostora, Determinizem in stacionarnost, Invariantne količine, Surrogate testi, Kontrola kaosa.

Content (Syllabus outline):

Linear methods and general terminology, Nonlinear methods, Measurements of real word systems and noise, The concept - all the information is stored in a single variable, Phase space reconstruction, Determinism and stationarity, Invariant quantities, Surrogate tests, Chaos control.

Temeljni literatura in viri / Readings:

1. H. Kantz in T. Schreiber, *Nonlinear time series analysis* (Cambridge University Press, Cambridge, 2002).
2. H. D. I. Abarbanel, *Analysis of observed chaotic data* (Springer, New York, 1996).
3. M. Small, *Applied Nonlinear Time Series Analysis* (World Scientific Publishing, Singapore, 2005).
4. J. C. Sprott, *Chaos and Time-Series Analysis* (Oxford University Press, Oxford, 2003).

Cilji in kompetence:

Ponuditi pregled metod, razvitih v okviru teorije nelinearnih dinamičnih sistemov, katere je moč uporabiti na realnih izmerjenih podatkih.

Objectives and competences:

To provide an overview of methods, developed in the framework of the theory of nonlinear dynamical systems, which can be used on real-life measured data.

Predvideni študijski rezultati:

Znanje in razumevanje:
Obvladovanje metod, razvitih v okviru teorije nelinearnih dinamičnih sistemov, katere je moč uporabiti na realnih izmerjenih podatkih.

Intended learning outcomes:

Knowledge and understanding:
Mastering methods, developed in the framework of the theory of nonlinear dynamical systems, which can be used on real-life measured data.

Prenesljive/ključne spretnosti in drugi atributi:
Sposobnost aplikacije spoznanih metod na poljubnih sistemih in v okviru različnih znanstvenih panog, ter tako zagotoviti interdisciplinarni pristop k reševanju problemov.

Transferable/Key Skills and other attributes:
The ability to apply above methods on various systems and in the framework of different scientific disciplines, thus assuring an interdisciplinary approach to problem solving.

Metode poučevanja in učenja:

Predavanja in individualno raziskovalno delo.

Learning and teaching methods:

Lectures and individual research work.

Načini ocenjevanja:

Ustni izpit
Seminarska naloga

Delež (v %) /
Weight (in %)

80%
20%

Assessment:

Oral exam
Written seminar work

Reference nosilca / Lecturer's references:

GOSAK, Marko, PERC, Matjaž, KRALJ, Samo. The impact of static disorder on vibrational resonance in a ferroelectric liquid crystal. *Mol. cryst. liq. cryst. (Phila. Pa. : 2003)*, 2012, vol. 553, no. 1, str. 13-20, doi: [10.1080/15421406.2011.609343](https://doi.org/10.1080/15421406.2011.609343). [COBISS.SI-ID [18878472](https://www.cobiss.si/id/18878472)]

SZOLNOKI, Attila, PERC, Matjaž. Conditional strategies and the evolution of cooperation in spatial public goods games. *Phys. rev., E Stat. nonlinear soft matter phys. (Print)*, 2012, vol. 85, iss. 2, str. 026104-1-026104-7, graf. prikazi, doi: [10.1103/PhysRevE.85.026104](https://doi.org/10.1103/PhysRevE.85.026104). [COBISS.SI-ID [18940680](https://www.cobiss.si/id/18940680)]

WANG, Zhen, SZOLNOKI, Attila, PERC, Matjaž. Percolation threshold determines the optimal population density for public cooperation. *Phys. rev., E Stat. nonlinear soft matter phys. (Print)*, 2012, vol. 85, iss. 3, str. 037101-1-037101-4, doi: [10.1103/PhysRevE.85.037101](https://doi.org/10.1103/PhysRevE.85.037101). [COBISS.SI-ID [18986248](https://www.cobiss.si/id/18986248)]

LIU, Yongkui, CHEN, Xiaojie, ZHANG, Lin, WANG, Long, PERC, Matjaž. Win-stay-lose-learn promotes cooperation in the spatial prisoner's dilemma game. *PLoS one*, 2012, vol. 7, iss. 2, str. e30689-1-e30689-8, doi: [10.1371/journal.pone.0030689](https://doi.org/10.1371/journal.pone.0030689). [COBISS.SI-ID [18986504](https://www.cobiss.si/id/18986504)]

PERC, Matjaž. Sustainable institutionalized punishment requires elimination of second-order free-riders. *Scientific reports*, 2012, vol. 2, art. no. 344, 6 str., doi: [10.1038/srep00344](https://doi.org/10.1038/srep00344). [COBISS.SI-ID [19071752](https://www.cobiss.si/id/19071752)]