

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.		1,2	1,2,3,4
Physics 2 nd degree		1,2	1,2,3,4

Vrsta predmeta / Course type izbirni/ elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
60					90	5

Nosilec predmeta / Lecturer: Matjaž Perc

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:

Ni pogojev.

Prerequisites:

None.

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:

Podati 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:

Intended learning outcomes:

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

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.

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.

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, projektno delo.

Learning and teaching methods:

Lectures, project work.

Načini ocenjevanja:

Ustni izpit
 Projekt

Delež (v %) /

Weight (in %)

Assessment:

Oral exam

Project

Reference nosilca / Lecturer's references:

1. BARAČ, Uroš, PERC, Matjaž, GOSAK, Marko. Determinants of collective failure in excitable networks. *Chaos*. 2023, vol. 33, iss. 4, [article no.] 043120, 9 str. ISSN 1054-1500. DOI: 10.1063/5.0149578. [COBISS.SI-ID 149413891]
2. ŠTERK, Marko, DOLENŠEK, Jurij, SKELIN, Maša, KRIŽANČIĆ BOMBEEK, Lidija, PARADIŽ, Eva, KERČMAR, Jasmina, PERC, Matjaž, RUPNIK, Marjan, STOŽER, Andraž (avtor, korespondenčni avtor), GOSAK, Marko (avtor, korespondenčni avtor). Functional characteristics of hub and wave-initiator cells in β cell networks. *Biophysical journal*. 2023, vol. 122, iss. 5, str. 784-801, ilustr. ISSN 0006-3495. DOI: [10.1016/j.bpj.2023.01.039](https://doi.org/10.1016/j.bpj.2023.01.039). [COBISS.SI-ID 141760003]
3. DUH, Maja, SKOK, Kristijan, PERC, Matjaž, MARKOTA, Andrej, GOSAK, Marko. Computational modeling of targeted temperature management in post-cardiac arrest patients. *Biomechanics and modeling in mechanobiology*. Oct. 2022, vol. 21, iss. 5, str. 1407-1424. ISSN 1617-7940. DOI: 10.1007/s10237-022-01598-x. [COBISS.SI-ID 114648835]