Univerza v Mariboru

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Fakulteta za naravoslovje in matematiko

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**
Physics 2nd degree		1	**2**

Vrsta predmeta / Course type	izbirni/optional
Univerzitetna koda predmeta / University course code:	

Predavanja **Lectures**	**Seminar** **Seminar**	**Sem. vaje** **Tutorial**	**Lab. vaje** **Laboratory work**	**Teren. vaje** **Field work**	**Samost. delo** **Individ. work**	**ECTS**
15		**30**			**105**	**5**

Nosilec predmeta / Lecturer:	Matjaž Perc

Jeziki / Languages:	**Predavanja / Lectures:**	**slovenski/Slovenian**
	Vaje / Tutorial:	**slovenski/Slovenian**

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Osnove teorije dinamičnih sistemov in programiranja v poljubnem jeziku.	Basic knowledge of dynamical system's theory and programming skills in an arbitrary language.

Vsebina:	**Content (Syllabus outline):**
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.	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:	**Objectives and competences:**
Ponuditi pregled metod, razvitih v okviru teorije nelinearnih dinamičnih sistemov, katere je moč uporabiti na realnih izmerjenih podatkih.	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:	**Learning and teaching methods:**
Predavanja in individualno raziskovalno delo.	Lectures and individual research work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ustni izpit Projektna naloga	**80%** **20%**	Oral exam Written project work

Reference nosilca / Lecturer's references:

Evolution of the most common English words and phrases over the centuries, Matjaž Perc, J. R. Soc. Interface (2012)

Culturomics meets random fractal theory: Insights into long-range correlations of social and natural phenomena over the past two centuries, Jianbo Gao, Jing Hu, Xiang Mao and Matjaž Perc, J. R. Soc. Interface 9, 1956-1964 (2012)

Experimental observation of a chaos-to-chaos transition in laser droplet generation, Blaž Krese, Matjaž Perc and Edvard Govekar, Int. J. Bifurcat. Chaos 21, 1689-1699 (2011)
The dynamics of laser droplet generation, Blaž Krese, Matjaž Perc and Edvard Govekar, Chaos 20, 013129 (2010)

Prevalence of stochasticity in experimentally observed responses of pancreatic acinar cells to acetylcholine, Matjaž Perc, Marjan Rupnik, Marko Gosak and Marko Marhl, Chaos 19, 037113 (2009)

Nonlinearities in mating sounds of American crocodiles, Tina P. Benko and Matjaž Perc, BioSystems 97, 154-159 (2009)

Singing of Neoconocephalus robustus as an example of deterministic chaos in insects, Tina P. Benko and Matjaž Perc,

J. Biosci. 32, 797-804 (2007)

Irregularity test for very short electrocardiogram (ECG) signals as a method for predicting a successful defibrillation in patients with ventricular fibrillation, Timotej Jagrič, Marko Marhl, Dušan Štajer, Špela Tadel Kocjančič, Tomaž Jagrič, Matej Podbregar and Matjaž Perc, Translational Research 149, 145-151 (2007)

Deterministic chaos in sounds of Asian cicadas, Tina P. Benko and Matjaž Perc, J. Biol. Syst. 14, 555-566 (2006)

Nonlinear time series analysis of the human electrocardiogram, Matjaž Perc, Eur. J. Phys. 26, 757-768 (2005)

The dynamics of human gait, Matjaž Perc, Eur. J. Phys. 26, 525-534 (2005)

Detecting chaos from a time series, Stane Kodba, Matjaž Perc and Marko Marhl, Eur. J. Phys. 26, 205-215 (2005)