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	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:	**Prerequisits:**
Ni pogojev.	None.

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:**
Podati 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:	Knowledge and understanding:
Obvladovanje metod, razvitih v okviru teorije nelinearnih dinamičnih sistemov, katere je moč uporabiti na realnih izmerjenih podatkih.	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:	**Learning and teaching methods:**
Predavanja, projektno delo.	Lectures, project work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ustni izpit	50%	Oral exam
Opravljeno projektno delo	50%	Done project work

Reference nosilca / Lecturer's references:

GINOUX, Jean-Marc, RUSKEEPÄÄ, Heikki, PERC, Matjaž, NAECK, Roomila, DI COSTANZO, Véronique, BOUCHOUICHA, Moez, FNAIECH, Farhat, SAYADI, Mounir, HAMDI, Takoua. Is type 1 diabetes a chaotic phenomenon?. Chaos, solitons and fractals. [Print ed.], 2018, vol. 111, str. 198-205, doi: 10.1016/j.chaos.2018.03.033. [COBISS.SI-ID 24052232], [JCR, SNIP, WoS do 7. 2. 2019: št. citatov (TC): 2, čistih citatov (CI): 1, Scopus do 29. 4. 2019: št. citatov (TC): 4, čistih citatov (CI): 3]

NARIN, Ali, ISLER, Yalcin, OZER, Mahmut, PERC, Matjaž. Early prediction of paroxysmal atrial fibrillation based on short-term heart rate variability. Physica. A, Statistical mechanics and its applications, ISSN 0378-4371. [Print ed.], 2018, vol. 509, str. 56-65, doi: 10.1016/j.physa.2018.06.022. [COBISS.SI-ID 24163848], [JCR, SNIP, WoS do 1. 2. 2019: št. citatov (TC): 1, čistih citatov (CI): 0, Scopus do 29. 4. 2019: št. citatov (TC): 2, čistih citatov (CI): 1]

GOSAK, Marko, STOŽER, Andraž, MARKOVIČ, Rene, DOLENŠEK, Jurij, MARHL, Marko, RUPNIK, Marjan, PERC, Matjaž. The relationship between node degree and dissipation rate in networks of diffusively coupled oscillators and its significance for pancreatic beta cells. Chaos, ISSN 1054-1500, July 2015, vol. 25, iss. 7, 073115-1-073115-8, doi: 10.1063/1.4926673. [COBISS.SI-ID 512523576], [JCR, SNIP, WoS do 13. 1. 2019: št. citatov (TC): 11, čistih citatov (CI): 7, Scopus do 28. 12. 2018: št. citatov (TC): 11, čistih citatov (CI): 7]

PERC, Matjaž. Nonlinear time series analysis of the human electrocardiogram. European journal of physics, ISSN 0143-0807, 2005, vol. 26, no. 5, str. 757-768, ilustr. http://dx.doi.org/10.1088/0143-0807/26/5/008. [COBISS.SI-ID 14505992], [JCR, SNIP, WoS do 28. 4. 2019: št. citatov (TC): 70, čistih citatov (CI): 62, Scopus do 18. 5. 2019: št. citatov (TC): 85, čistih citatov (CI): 77]

HELBING, Dirk, BROCKMANN, Dirk, CHADEFAUX, Thomas, DONNAY, Karsten, BLANKE, Ulf, WOOLLEY-MEZA, Olivia, MOUSSAID, Mehdi, JOHANSSON, Anders, KRAUSE, Jens, SCHUTTE, Sebastian, PERC, Matjaž. Saving human lives : what complexity science and information systems can contribute. Journal of statistical physics, ISSN 0022-4715, 2015, vol. 158, iss. 3, str. 735-781, doi: 10.1007/s10955-014-1024-9. [COBISS.SI-ID 21182728], [JCR, SNIP, WoS do 12. 5. 2019: št. citatov (TC): 104, čistih citatov (CI): 100, Scopus do 28. 5. 2019: št. citatov (TC): 128, čistih citatov (CI): 124]