

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Naključne spremenljivke
Course title:	Random variables

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	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30	0	60	0	0	210	10

Nosilec predmeta / Lecturer:

Matjaž Perc

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenski/Slovenian

slovenski/Slovenian

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

Vsaka obveznost študenta v načinih ocenjevanja mora biti opravljena s pozitivno oceno. Opravljen projekt je pogoj za pristop k ustnemu izpitu.

Prerequisites:

Each student requirement within the assessment methods must be completed with a passing grade. Completed project is a prerequisite for taking the oral exam.

Vsebina:

Naključne spremenljive ternaključni dogodki in verjetnost, Stohastični procesi, Markovianski procesi, Master enačba, Fokker-Planckova enačba, Langevinski pristop, Stohastične diferenčne enačbe, Stohastične navadne diferencialne enačbe, Stohastične parcialne diferencialne enačbe, Levijski leti.

Content (Syllabus outline):

Random variables, Random events and the probability, Stochastic processes, Markov processes, Master equation, Fokker-Planck equation, Langevin approach, Stochastic difference equations, Ordinary stochastic differential equations, partial stochastic differential equations, Levy flights.

Temeljni literatura in viri / Readings:

N. G. Van Kampen, *Stochastic processes in physics and chemistry* (Elsevier, Amsterdam, 1992).
J. Honerkamp, *Stochastic dynamical systems* (VCH, New York 1994).
H. Risken, *The Fokker-Planck equation* (Springer, Berlin, 1984).
C. W. Gardiner, *Handbook of Stochastic Methods* (Springer, New York 2004).

Cilji in kompetence:

Podati koncepte in metode, ki služijo za analizo in pridobitev razumevanja naključnih spremenljivk v realnem svetu.

Objectives and competences:

Deliver methods and concepts of key conceptual approaches and methods, which can be used to analyse and gain understanding of random variables in the real world.

Predvideni študijski rezultati:

Znanje in razumevanje:

Obvladovanje osnovnih konceptov in metod, ki služijo za analizo in pridobitev razumevanja naključnih spremenljivk v realnem svetu.

Prenesljive/ključne spretnosti in drugi atributi:

Sposobnost prepoznati in analizirati naključne spremenljivke kjerkoli se pojavijo, in torej imeti možnost prosperirati v različnih znanstvenih disciplinah kot so ekonomija, kemija, fizika, medicina, in sociologija..

Intended learning outcomes:

Knowledge and Understanding:

Mastering key conceptual approaches and methods, which can be used to analyse and gain understanding of random variables in the real world.

Transferable/Key Skills and other attributes:

The ability to recognize and analyse random variables wherever they may occur, and thus have the potential to prosper in diverse scientific disciplines such as: economy, chemistry, physics, medicine, and sociology.

Metode poučevanja in učenja:

Predavanja, projektno delo.

Learning and teaching methods:

Lectures, project work.

Delež (v %) / Weight (in %)		Assessment:
Načini ocenjevanja:		
Ustni izpit		Oral exam
Projekt	50	Project
	50	

Reference nosilca / Lecturer's references:

1. SZOLNOKI, Attila, PERC, Matjaž. Oppressed species can form a winning pair in a multi-species ecosystem. *Applied mathematics and computation*. [Print ed.]. Feb. 2023, vol. 438, str. 1-8. ISSN 0096-3003. DOI: 10.1016/j.amc.2022.127568. [COBISS.SI-ID 125126147]
2. HU, Kaipeng, SHI, Lei, TAO, Yewei, PERC, Matjaž. Cumulative advantage is a double-edge sword for cooperation. *Europhysics letters : EPL*. 2023, vol. 142, no. 2, [article no.] 21001, str. 1-5. ISSN 0295-5075. DOI: 10.1209/0295-5075/acc7c4. [COBISS.SI-ID 148671747]
3. PESSA, Arthur A. B., PERC, Matjaž, RIBEIRO, Haroldo V. Age and market capitalization drive large price variations of cryptocurrencies. *Scientific reports*. 2023, vol. 13, [article no.] 3351, str. 1-12, ilustr., graf. prikazi. ISSN 2045-2322. DOI: [10.1038/s41598-023-30431-3](https://doi.org/10.1038/s41598-023-30431-3). [COBISS.SI-ID [148016131](https://cobiss.si/id/148016131)]