COURSE DESCRIPTION

General information		
Lead instructor	Assistant Professor Bernard Ženko Associate Professor Mislav Balković	
Course name	**CDS-10: Time series analysis**	
Study programme	**Computer and Data Science, third cycle Doctoral Study Programme**	
Course status	Elective	
Year	First or Second	
Number of credits and mode of delivery	ECTS student workload coefficient	10
	Number of hours (L+P+S)	20/10/270

Course description

1.1. Course goals

Learning unit contributes to development of the following general competencies:

- ability to identify a research problem, analyze it, and offer possible solutions.
- ability to create new knowledge, which represents a contribution to science
- mastery of standard research methods, procedures and processes in diverse scientific fields

and subject-specific competencies:

- development of skills and abilities in usage of knowledge in the scientific field of doctoral dissertation
- ability to design and implement original solutions of given scientific problems
- ability to formulate appropriate research questions when faced with time series obtained from a real system
- skills in examining time-series data via a diverse range of computational methods, including their combinations

1.2. Course enrolment requirements

There is none.

1.3. Intended course learning outcomes

Knowledge and understanding:

The student:

- becomes familiar with modern time series analysis,
- learns the methods and algorithms for predicting time series via real examples,

- becomes familiar with the concept of forecasting in science and technology,
- learns a vast array of methods for extracting information from data arranged as time series.

1.4. Course content

- Concept of time series and their analysis. Relevance to complex networks, data science and computer sciences
- Time series graphics, scatter-plots. Patterns in time series
- Time scales and seasonality in data
- Correlations and auto-correlations
- Time series regression models. Least squares
- ARIMA models. Stationarity and differencing
- Autoregressive models. Moving average models
- Forecasting time series
- Dynamic regression models. Stochastic and deterministic trends
- Predicting time series with machine learning methods, neural networks
- - Some practical forecasting issues

1.5. Modes of delivery (mark the appropriate boxes with an X)	☒ *lectures* ☐ *seminars and workshops* ☒ *practicals* ☐ *remote learning* ☐ *field work*	☒ *independent work* ☐ *multimedia and network* ☐ *laboratory* ☐ *supervision* ☐ *other* _____

1.6. Student obligations

1.7. Monitoring student work (mark the appropriate boxes with an X)

Class attendance		Participation in class		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Continuous assessment of knowledge		Student report		Practical work	
Portfolio		Schoolwork		Homework			

1.8. Assessment and evaluation of student work during classes and the final exam

Type (examination, oral, coursework, project):

- Project assignment customized for each student, 100%

1.9. Required readings and number of copies relative to the number of students currently taking the course

Title	*Number of copies*	*Number of students*
Hyndman, R. J., & Athanasopoulos, G. (2021). Forecasting: principles and practice, 3rd edition, OTexts: Melbourne, Australia. https://otexts.com/fpp3/		
Nielsen A. (2019). Practical Time Series Analysis: Prediction with Statistics and Machine Learning. O'Reilly.		

1.10. Supplementary readings		
1.11. Methods of quality monitoring that ensure the acquisition of knowledge, skills and competences.		