Course Unit Descriptor

Study Programme: Applied Mathematics – Data Science

Course Unit Title: Time series

Course Unit Code: MDS13

Name of Lecturer(s): Nataša M. Krklec Jerinkić

Type and Level of Studies: Master studies

Course Status (compulsory/elective): Elective

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:

Acquiring basic knowledge and results in the theory of time series, and classical and contemporary methods of time series modelling.

Learning Outcomes:

At the end of the course students must demonstrate comprehension and knowledge of theoretical fundaments as well as practical skills in time series modeling, and application of these in economics.

Syllabus:

Theory

The basic purpose and approach to time series analysis. Descriptive techniques and graphical presentation of time series. Time series fitting in the time domain: estimating the autocovariance function, fitting the moving averages (MA) process, ARMA and ARIMA models. Prediction theory. Spectral analysis. Linear and nonlinear models. Heteroscedasticity: ARCH and GARCH models. Forecasting trend and seasonality. Application of time series in finance.

Practice

The exercises follow the topics covered at the theoretical lectures. Solving examples, exercises and real world problems. Modeling of time series using MATLAB and statistical software.

Required Reading:

1. J. Mališić, *Vremenske serije*, Matematički fakultet, Beograd, 2002.

2. C. Chatfield, *The Analysis of Time Series: An Introduction*, Sixth Edition, Taylor & Francis, 2003.

3. R.S. Tsay.: *Analysis of Financial Time Series*, Wiley, 2002.

4. D.C. Montgomery, C.L. Jennings, M. Kulahci, *Introduction to Time Series Analysis and Forecasting*, Wiley, 2008.

Weekly Contact Hours:	**Lectures:** 2	**Practical work:** 3

Teaching Methods:

Plenary lectures and problem sessions are conducted by classical teaching methods. On problem sessions, students solve exercises and examples from topics that were covered at theoretical lectures, discuss the solutions and learn to use computers and statistical software to implement and model time series in real world problems.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class		written exam	

participation			
Practical work		oral exam	50
Preliminary exam(s)	50	…….	
Seminar(s)			
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			