Program	Type of studies (cycle)	Third cycle
	Name of the program	Science and mathematics education

Course

Course title	**Time serries**

Course code	Semester	Course status	ECTS credits	Contact hours
AMAT654	II	Optional	10	30

Teaching staff	Teacher	
	Other staff	
Course goals	Adoption of basic concepts and results of the theory of time series Meeting with classic and modern methods of modeling real time series.	

Course content/topics

- Introduction. Examples of time series. Trend and seasonality of time series. Autocorrelation function. Multidimensional normal distributions.
- Stationary series. Strong and weak stationary. White noise. Linear processes. ARMA processes. Causalities and invertibility of the ARMA process. MA(oo) processes. Partial autocorrelation function. Assessment of autocorrelation function and other parameters. Prediction of stationary time series. Modeling
- and prediction of the ARMA process. Asymptotic behavior of expectation and function autocorrelation of the sample. Assessment of ARMA process parameters.
- Spectral analysis. Spectral density. A periodogram. Spectral density ARMA process. Herglotz theorem.
- Non-stationary and nonlinear models of time series. ARIMA AND SARIMA models. Nonlinear models. ARCH and GARCH models. Chaotic deterministic series.
- Statistics of stationary processes. Asymptotic results for random statistics processes. Assessment of trend and seasonality. Nonparametric methods.

LITERATURE

[1] P. J. Brockwell, R. A. Davis, Introduction to Time Series and Forecasting, Springer Verlag, 2002.

[2] P. J. Brockwell, R. A. Davis, Time Series: Theory and Methods, Springer Verlag, 1991.

[3] J. Fan and Q. Yao, Nonlinear Time Series. Nonparametric and Parametric Methods, Springer Verlag, 2003.

[4] D. Bosq, Nonparametric Statistics for Stochastic Processes: Estimation and Prediction, Springer Verlag, 1998.

[5] A. W. van der Vaart, Asymptotic Statistics, Cambridge University Press, 1998.

[6] J. D. Hamilton, Time Series Analysis, Princeton University Press, 1994.

[7] P. Embrechts, C. Klueppelberg, T. Mikosch, Modelling extremal events. For insurance and finance, Springer Verlag, 1997.

Grading

	Criterion	Points	Cut-off points
1.	Written assignment	25	13
2.	Project	25	12
3	Final exam	50	30
	Total	100	55