DOCTORAL (PHD) STUDIES
COURSE DESCRIPTION

Course title	Field of science	Faculty	Institute
Dependence Measures and Copulas	Mathematics (N 001)	Faculty of Mathematics and Informatics	Institute of Mathematics, Institute of Applied Mathematics
Study method	Number of credits	Study method	Number of credits
Lectures	0	Consultations	1
Individual work	4	Seminars	0

Course summary
1. Main properties of copulas: definition, examples, Sklar's theorem, connection to random variables, Frechet-Hoeffding bounds, survival copula, symmetry, order relations, generation of random variables, multivariate copulas
2. Copula construction methods: inversion, geometrical, algebraic, copulas with special properties, construction of multivariate copulas
3. Archimedean copulas: definition, one- and two-parameter copulas families, fundamental properties, multivariate Archimedean copulas
4. Dependence measures: Kendall's tau, Spearman's rho, their relationship, othe measures of concordance and association, tail monotonicity and dependence, multivariate dependence, empirical copulas
5. Quasicopulas and transformations of distribution functions

Main literature
1. Nelsen R.B., *An Introduction to Copulas*, 2nd ed. Springer Series in Statistics, 2006
2. Durante F. and Sempi C., *Principles of Copula Theory*, Taylor and Francis, 2016

Consulting teacher	Scientific degree	Pedagogical name	Main publications in the field of science of the last 5 year period
Remigijus Leipus	Habil. dr.	Prof.	1. Skorniakov V., Leipus R., Juzeliūnas G., Staliūnas K. Group testing: Revisiting the ideas. *Nonlinear Analysis: Modelling and Control*. 2021. **26**. 534-549. 2. Jokubaitis S., Celov D., Leipus R. Sparse structures with LASSO through Principal Components: forecasting GDP components in the short-run. *International Journal of Forecasting*. 2021. **37**. 759-756. 3. Leipus R., Philippe A., Pilipauskaitė V., Surgailis D. Estimating long memory in panel random-coefficient AR(1) data. *Journal of Time Series Analysis*. 2020. **41**. 520-535.
Martynas Manstavičius	Dr.	Assoc. Prof.	1. Manstavicius, M. and Bagdonas, G., A class of bivariate copula mappings, Fuzzy Sets and Systems, 354, 48-62 (2019) 2. Manstavičius, M. and Bagdonas, G., A class of bivariate independence copula transformations, Fuzzy Sets and Systems, in press (2021), https://doi.org/10.1016/j.fss.2020.12.022 3. Manstavičius, M. and Leipus, R., Bounds for the Clayton copula, Nonlinear Analysis-Modelling and Control, 22(2), pp. 248-260 (2017) 4. Manstavičius, M. and Schnurr, A., Criteria for the finiteness of the strong p-variation for Levy-type processes, Stochastic Analysis and Applications, 35(5), pp. 873-899 (2017)

			5. Andrulytė, I.M.; Manstavičius, M. and Šiaulys, J., Randomly stopped maximum and maximum of sums with consistently varying distributions, Modern Stochastics-Theory And Applications 4 (1), pp. 65-78 (2017)

Approved by the Board of Faculty of Mathematics and Informatics 10/12/2021. Resolution No. (1.5 E) 110000-TPN-42
Board Chairman – assoc. prof. dr. Kristina Lapin