DOCTORAL (PHD) STUDIES
COURSE DESCRIPTION

Course title	Field of science	Faculty	Institute
Algebraic Combinatorics	Mathematics (N 001)	Faculty of Mathematics and Informatics	Institute of Mathematics

Study method	Number of credits	Study method	Number of credits
Lectures	0	Consultations	1
Individual work	4	Seminars	0

Course summary
1. Spectral graph theory. Adjacency matrix and Laplacian of a graph. Characteristic polynomial, eigenvalues and eigenvectors. Connections to graph parameters.
2. Polynomial algebra in graph theory. Matching, chromatic, Tutte's, and other polynomials.
3. Formal power series algebra. Walk generating functions on graphs.
4. Factorgraphs, spectral analysis in them.
5. Strongly regular graphs, designs and distance matrices.
6. Pfaffians and graphs.
7. Symmetric group and orbits. Polya theory. The group of graph authomorphizms. Graph enumeration.

Main literature
1. C.D. Godsil, *Algebraic Combinatorics,* Chapman and Hall, 1993.
2. R. Stanley, *Algebraic Combinatorics,* Springer, 2013
3. Fan R.K. Chung, *Spectral Graph Theory*, AMS, CBMS, Nr. 92, 1997.
4. R.A. Brualdi, *The Mutually Beneficial Relationship of Graphs and Matrices*, AMS, CBMS, Nr 115, 2011.

Consulting teacher	Scientific degree	Pedagogical name	Main publications in the field of science of the last 5 year period
Eugenijus Manstavičius	Habil. dr.	Prof.	1. E. Manstavičius, On mean values of multiplicative functions on the symmetric group, *Monatshefte für Mathematik*, 2017, **182**, 359–376. 2. E. Manstavičius, Local probabilities and total variation distance for random permutations, *Ramanujan J.*, 2017, **43,** 679–696 (jointly with R. Petuchovas). 3. E. Manstavičius, Variance of an additive defined on random assemblies, *Lithuanian Math. J.*, 2017, **57**(2), 222–235 (jointly with V. Stepas). 4. E. Manstavičius, The Turan-Kubilius inequality on permutations, *Annales Univ. Sci. Budapest., Sect. Comp.*, 2018, **48**, 45–51 (jointly with J. Klimavičius). 5. E. Manstavičius, Moments of additive statistics with respect to the Ewens Sampling Formula, *Publ. Math. Debrecen*, 2019, **95** (3–4) 259–277 (jointly with V. Stepas). 6. E. Manstavičius, Sharp bounds for the variance of linear statistics on random permutations, *Random Struct. Algorithms,* 2020, **57**(4), 1303–1313. 7. E. Manstavičius, A sharp inequality for the variance with respect to the Ewens sampling formula, *Lithuanian Math. J.*, 2021, 61(3), 289–300 (jointly with Ž. Baronėnas and P. Šapokaitė).

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