

**DOCTORAL (PHD) STUDIES
COURSE DESCRIPTION**

Course title	Field of science	Faculty	Institute
Analytic and Probabilistic 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. Combinatorial structures: partitions of a natural number, set partitions, polynomials over a finite field, permutations, mappings of a finite set into itself, binary trees, assemblies, weighted multisets, selections.
2. Generating series of combinatorial structures, their role in enumeration theory.
3. Asymptotic methods: Darboux, Tauber, the saddle point, Flajolet- Odlyzko method.
4. Mappings defined in the sets of combinatorial structures. Mean values of multiplicative functions.
5. Probabilistic measures defined in the sets of combinatorial structures. Distributions of the component vectors and conditional probabilities. Asymptotic distributions. Application of the conditional probability estimates.
6. Feller's coupling: expressions of the random permutation parameters via independent random variables.
7. The total variation distance estimates in the class of random permutations and in the class of logarithmic assemblies.
8. Distribution of additive functions defined in the classes of decomposable combinatorial structures, moments, asymptotic distributions. The law of large numbers, the central limit theorem and the functional limit theorems.

Main literature

1. R. Arratia, A.D. Barbour and S. Tavaré, *Logarithmic Combinatorial Structures: a Probabilistic Approach*, EMS Monographs in Mathematics, EMS Publishing House, Zurich, 2003.
2. Ph. Flajolet and G. Sedgewick, *Analytic Combinatorics*, Cambridge University Press, 2008.
3. E. Manstavičius, *Analytic and probabilistic combinatorics (in Lithuanian)*, TEV, Vilnius, 2007.

Consulting teacher	Scientific degree	Pedagogical name	Main publications in the field of science of the last 5 year period
Eugenijus Manstavičius	Habil. dr.	Prof.	<ol style="list-style-type: none"> 1. E. Manstavičius, On mean values of multiplicative functions on the symmetric group, <i>Monatshefte für Mathematik</i>, 2017, 182, 359–376. 2. E. Manstavičius, Local probabilities and total variation distance for random permutations, <i>Ramanujan J.</i>, 2017, 43, 679–696 (jointly with R. Petuchovas). 3. E. Manstavičius, Variance of an additive defined on random assemblies, <i>Lithuanian Math. J.</i>, 2017, 57(2), 222–235 (jointly with V. Stepas). 4. E. Manstavičius, The Turan-Kubilius inequality on permutations, <i>Annales Univ. Sci. Budapest., Sect. Comp.</i>, 2018, 48, 45–51 (jointly with J. Klimavičius). 5. E. Manstavičius, Moments of additive statistics with respect to the Ewens Sampling Formula, <i>Publ. Math. Debrecen</i>, 2019, 95 (3–4) 259–277 (jointly with V. Stepas). 6. E. Manstavičius, Sharp bounds for the variance of linear statistics on random permutations, <i>Random Struct. Algorithms</i>, 2020, 57(4), 1303–1313. 7. E. Manstavičius, A sharp inequality for the variance with respect to the Ewens sampling formula, <i>Lithuanian Math. J.</i>, 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