

Monday, April 20, 2026
from 4:45 p.m. to 6:20 p.m. (Moscow time)
room 16-10 and ZOOM translation

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*Discrete Seifert foliations and
Chebyshev polynomials*

The main aim of this report is to study the spectral invariants of circulant foliations of a graph. Such graphs can be viewed as a discrete analog of Seifert fiber space. The base graph is assumed to be fixed, and the cyclic covering group has an arbitrarily large order. Circulant graphs are a classic example of such coverings. They cover a single-vertex graph with a given number of loops. More complex representatives of the family of cyclic coverings include I -, Y -, and H -graphs, generalized Petersen graphs, sandwich graphs, discrete tori, and many others.

This talk is devoted to deriving analytical formulas for calculating characteristic Laplace polynomials. Knowledge of such a polynomial allows us to determine a number of fundamental spectral invariants of graphs. For example, the number of rooted spanning trees and forests. Also it helps to find their asymptotic behavior as the number of vertices tends to infinity, as well as studying the arithmetic properties of the numerical sequences that arise in these structures. Furthermore, for circulant graphs, we will provide precise formulas for calculating the Kirchhoff index, establishing that, up to an exponentially small remainder term, they are defined by third-degree polynomials. All of the invariants listed are determined by the spectrum of the Laplace matrix.

The main tool for proving these results are Chebyshev polynomials. The obtained formulas, as well as their asymptotic behavior, are effectively expressed in terms of the roots of linear combinations of Chebyshev polynomials.

References:

- (1) A. D. Mednykh, I. A. Mednykh, Cyclic coverings of graphs. Counting rooted spanning forests and trees, Kirchhoff index, and Jacobians. Russian Mathematical Surveys, 2023, Vol. 78, Iss. 3, P. 501–548.
- (2) Y. S. Kwon, A. D. Mednykh, I. A. Mednykh, On the structure of Laplacian characteristic polynomial for circulant foliation. Discrete Appl. Math. Vol. 375, P. 338–349 (2025).
- (3) Bobo Hua, A. D. Mednykh, I. A. Mednykh, Lili Wang, On the complexity of Cayley graphs on a dihedral group. Discrete Math. Vol. 349, No. 1, Article ID 114662, 11 p. (2026).

SCIENTIFIC SEMINAR
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headed by Academician of RAS Anatoly T. Fomenko

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