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International Seminar
"Operator Theory, Differential Equations and their Applications"

Seminar Chairmen: Prof. Anatoly G. Kusraev, Prof. Marat A. Pliev
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September 13, 4 PM (UTC+3)

On fractional Wiener chaos

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The report will present the normalized parabolic cylinder function $H_\alpha(x,t)$, which generalizes the probabilistic Hermite polynomial to the case of an arbitrary real parameter. It is shown that the system of functions $H_\alpha(x,t)$ is orthogonal and can be used to define such a concept as fractional Wiener chaos. The main properties of the function $H_\alpha(x,t)$, such as its representation through the Liouville fractional derivative and the Cauchy problem for the parabolic equation that it satisfies, are also considered. A result has been obtained on the connection between the Appell integral transform introduced by E.V. Boguslavskaya, and the function $H_\alpha(x,t)$. Based on this connection, we can conclude that the Appell transform is a transformation operator that relates a deterministic world object, such as a power function, to its probabilistic counterpart, such as the Hermite polynomial and the function $H_\alpha(x,t)$. Application of the Appell transformation allows us to consider a new stochastic process $H_\alpha(W_t,t)$, where W_t is a Wiener process, to draw a conclusion about its martingale and obtain other probabilistic properties. Thus, an approach based on combining the theory of fractional calculus, integral transformations, transformation operators, the theory of orthogonal polynomials and partial differential equations allows us to introduce and study new probabilistic objects with the necessary properties.

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The seminar is organized by North Caucasus Center for Mathematical Research of the Vladikavkaz Scientific Center of the RAS jointly with Southern Mathematical Institute of the Vladikavkaz Scientific Center of the RAS.

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