

Bahçeşehir University, Istanbul, Türkiye
Analysis & PDE Center, Ghent University, Ghent, Belgium
Institute Mathematics & Math. Modeling, Almaty, Kazakhstan

“Analysis and Applied Mathematics”

Weekly Online Seminar

Seminar leaders:

Prof. Allaberen Ashyralyev (BAU, Istanbul),
Prof. Michael Ruzhansky (UGent, Ghent),
Prof. Makhmud Sadybekov (IMMM, Almaty)

Date: **Tuesday, June 17, 2025**

Time: 14.00-15.00 (Istanbul) = 13.00-14.00 (Ghent) = 16.00-17.00 (Almaty)

Zoom link: <https://us02web.zoom.us/j/6678270445?pwd=SFNmQUlVTDtRaHlDa-VYrN3I5bzJVQT09>, Conference ID: 667 827 0445, Access code: 1

Speaker:

Prof. Dr. Roland Duduchava

*Victor Kupradze Institute of Mathematics, University of Georgia & A. Razmadze
Mathematical Institute, Tbilisi, Georgia*

Title: Spectral theory of convolution integro-differential operators on monoids

Abstract: The interval $G = (-1, 1)$ turns into a Lie group under the group operation $x \circ y := (x + y)(1 + xy)^{-1}$, $x, y \in G$. Then $M = [0, 1)$ is a submonoid of G (has the same binary operation $x \circ y$) and we can induce the invariant Haar measure $d\mu_M = (1 - x^2)^{-1}dx$ and the Fourier transformation \mathcal{F}_M from G to M . The main object of the investigation is the convolution operator $W_{M,a} := r_+ W_{G,a}^0 \ell_+$, $W_{G,a}^0 := \mathcal{F}_G^{-1} a \mathcal{F}_G$ restricted from G .

Theory of convolution operators $W_{M,a}$ on the submonoid M is much more complicated, but more rich and important in applications (example of Wiener-Hopf equations on submonoid $M = [0, \infty)$ of the Lie group $G = (-\infty, \infty)$ is a good example). Convolution equation $W_{M,s} \varphi = f$ in the Generic Bessel potential space setting $f \in \mathbb{G}\mathbb{H}_p^{s-r}(M, d\mu_M)$, $\varphi \in \mathbb{G}\mathbb{H}_p^s(M, d\mu_M)$, $1 < p < \infty$, $s, r \in \mathbb{R}$, has non-trivial Fredholm index and the Fredholmity and solvability conditions for discontinuous symbols $a(\xi)$ depend on the parameters of the spaces. We expose full theory of such convolution integro-differential equations: Fredholm property and solvability criteria, index formula. Formula for solutions are available through the factorization of the symbol.

Biography:

Roland Duduchava received his PhD degree in 1971 from the A. Razmadze Mathematical Institute of the Georgian National Academy of Sciences, Georgia. He obtained the Doctor of Science degree (Habilitation) from the Moscow State University in 1983. He is currently a

professor at the University of Georgia, Tbilisi and the Director of the Victor Kupradze Institute of Mathematics of the University of Georgia, Tbilisi. Prof. R. Duduchava is the author of 4 monographs and many scientific papers. He is a member of the editorial boards of several international journals. His research focuses on Boundary Value Problems for PDEs, Equations of Mathematical Physics, Pseudodifferential Equations, Integral Equations, etc.