

**ON THE SPRING SESSION OF THE
ROMANIAN ITINERANT SEMINAR ON
MATHEMATICS AND ITS APPLICATIONS
(RISMA), 23 MAY 2025, BUCHAREST**

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**Opening Speech by Professor Gheorghe Moroșanu,
founder and coordinator of RISMA**

It is well known within the Romanian mathematical community that in 2017, I launched the Romanian Itinerant Seminar on Mathematical Analysis and Its Applications: www.cs.ubbcluj.ro/rismaa/. Since then, six successful annual meetings have taken place in various cities: Cluj-Napoca (2018), Constanța (2019), Alba Iulia (2021), Brașov (2022), Craiova (2023), and Cluj-Napoca again in 2024.

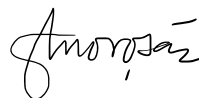
Last year, I proposed renaming the seminar as *Romanian Itinerant Seminar on Mathematics and Its Applications* (RISMA) and expanding its scope to include all areas of mathematics and their applications. Under this new format, the seminar is held twice a year, as part of the Spring and Autumn Scientific Conferences organized by the Academy of Romanian Scientists (ARS), and hosted in the same locations: www.aosr.ro/en/romanian-itinerant-seminar-on-mathematics-and-applications-sirma/.

RISMA participants include members of the ARS's Section of Mathematical Sciences, as well as other Romanian and international researchers interested in mathematics and its applications. The papers resulting from this seminar are typically published in the *Annals of the Academy of Roma-*

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nian Scientists, Series on Mathematics and Its Applications. However, on this occasion, only the abstracts of the talks will be published.

Wishing everyone the best of luck!



Bucharest, May 23, 2025

Presentations

Friday, May 23, 2025, 16:00–17:30, Headquarters of the Academy of Romanian Scientists (ARS), 3 Ilfov Str., Sector 5, Bucharest

This was the inaugural session of RISMA, which was attended by many participants, including eight presenters. Seven of the presenters were affiliated with the Mathematical Sciences Section of the Academy of Romanian Scientists, while the eighth, Dr. Teodor Havârneanu, represented the *Octav Mayer* Mathematics Institute in Iași, Romania. The abstracts of the presentations are included below, listed in alphabetical order by the names of the presenters. Full papers may be obtained by contacting the authors directly at the email addresses provided.

Aurelian CERNEA, Faculty of Mathematics and Computer Science, University of Bucharest, Corresponding Member of the Academy of Romanian Scientists, email: acernea@fmi.unibuc.ro

Title: **Some results concerning a sequential fractional differential inclusion**

Abstract: Consider a fractional differential inclusion involving the Caputo fractional derivative with nonlocal integro-multipoint boundary conditions and defined by a set-valued map with nonconvex values. An existence result and a topological property of its solution set are proved.

Vasile DRĂGAN, *Simion Stoilow* Mathematics Institute of the Romanian Academy, Bucharest, Full Member of the Academy of Romanian Scientists, email: vasile.dragan@imar.ro and **Ioan-Lucian POPA**, Department of Computing, Mathematics and Electronics, University of Alba Iulia, Alba Iulia, Romania, email: lucian.popa@uab.ro

Title: On a linear quadratic optimal control problem with indefinite sign on stochastic systems controlled by impulses

Abstract: We consider an optimal control problem asking for the minimization of a quadratic objective function along the trajectories of a linear stochastic system controlled by impulses. No assumption regarding the sign of the objective function is supposed. That is why, first, it is necessary to provide conditions which guarantee that the set of the values of this objective function is bounded from below. To this end, we use the maximal and bounded on the whole axis solution of a backward matrix linear differential equation with jumps, having the jumps described by a Riccati-type operator. We provide a set of necessary and sufficient conditions which guarantee the existence of this bounded and maximal solution and compute the exact value of the lower bound of the objective function. We show that if the control problem under consideration has an optimal control, then that control is unique, and it is in a state feedback form.

Teodor HAVÂRNEANU and Cătălin POPA, *Octav Mayer* Mathematics Institute of the Romanian Academy, Iași, Romania, email address: havi@uaic.ro, cpopa@uaic.ro

Title: An approximation scheme for stochastic flows by the splitting-up method

Abstract: We consider the following problem

$$(1) \quad v'(t) + Av(t) = \sigma(v(t))\dot{W}(t) \text{ in } H, \quad t \in (0, T); \quad v(0) = v_0,$$

where H is the Leray space, $A : Dom(A) = (H^2(D))^d \cap (H_0^1(D))^d \cap H \rightarrow H$ is the Stokes operator, $D \subset \mathbb{R}^d$ is a bounded domain, $d = 2, 3$, $\{W(t); t \geq 0\}$ is a Wiener process.

We split equation (1) into its deterministic part and stochastic part:

$$(2) \quad u'(t) + Au(t) = 0, \quad t \in [0, T],$$

$$(3) \quad y'(t) = \sigma(y(t))\dot{W}(t), \quad t \in [0, T].$$

Let $\varepsilon = T/n$, $n = 1, 2, \dots$. To compute the approximation of v at the time $t_m = m\varepsilon$, $0 \leq m \leq n$, we alternate the solution of the stationary equation $u + \varepsilon Au = w$ and the solution of equation (3) on $[0, \varepsilon]$, $(2m - 1)$ times, at each alternation the value of w and the initial value of (3) are the final value of the preceding solution.

Under certain hypotheses on σ we have obtained the convergence of this scheme.

Mircea LUPU, *Transylvania University, Braşov, Romania*, Corresponding Member of the Academy of Romanian Scientists, email: emlupu2006@yahoo.com

Title: Analytical and numerical study of the dynamical system of alcoholism and drug addiction

Abstract: In this paper, we present a dynamical system concerning the pattern of alcoholism and drug addiction. We study the stability of the solutions of the corresponding second-order nonlinear differential system. Because the solutions depend on three parameters, we must study the stability of the first approximation and, using three criteria (of Hopf, Bendixson, and Lyapunov), we show the existence of bifurcation and limit circle. The analysis of the situations that might appear is done directly, but also graphical and numerical analysis is done by using computer simulations for the trajectories with geometrical interpretation.

Gheorghe MOROŞANU, *Babeş-Bolyai University, Cluj-Napoca, Romania*, Full Member of the Academy of Romanian Scientists, email: [file://gheorghe.morosanu@ubbcluj.ro], gheorghe.morosanu@ubbcluj.ro

Title: On evolution equations governed by subdifferential operators

Abstract: Let H be a real Hilbert space and let $A : D(A) \subset H \rightarrow H$ be a (possibly multivalued) subdifferential operator. First, we briefly recall the most important results regarding the existence and asymptotic behavior for $t \rightarrow \infty$ of the solutions to the evolution equation (inclusion) $f(t) \in u'(t) + Au(t)$, $t > 0$, including contributions of J.-B. Baillon, H. Brezis, R.E. Bruck, Y. Kōmura, H. Okochi, and of the author. On this occasion, we show that a stability result of V. Barbu (1976) is in fact a particular case of a previous result of H. Brezis (1973). Also, we extend that Brezis' result establishing the weak convergence as $t \rightarrow \infty$ of every (weak) solution to the above evolution equation.

Cristinel MORTICI, *Valahia University of Târgovişte, Romania*, Full

Member of the Academy of Romanian Scientists, email: cristinel.mortici@hotmail.com

Title: **Approximations of the harmonic numbers and digamma function**

Abstract: We present new approximations of the harmonic numbers and the continuous variants of them, the digamma function. We use a Cesaro-Stolz-type lemma that allows us to find approximation sequences with a high convergence speed. Some inequalities are provided.

Dan TIBA, *Simion Stoilow* Mathematics Institute of the Romanian Academy, Bucharest, Full Member of the Academy of Romanian Scientists, email: dan.tiba@imar.ro

Title: **Optimal design of simple supported plates**

Abstract: We consider a simple supported plate with constant thickness, defined in an unknown multiply connected domain. We optimize its shape according to some given performance functionals. We propose a fixed domain method for this optimal design problem based on the penalization of the state system. Numerical experiments are also reported.

Savin TREANȚĂ, National University of Science and Technology POLITEHNICA Bucharest, Associate Member of the Academy of Romanian Scientists, email: savin.treanta@upb.ro

Title: **Efficiency conditions in some classes of variational models**

Abstract: This study deals with efficiency conditions in new interval-valued variational control models via a modified T -objective functional approach and saddle-point type criteria. In this regard, first, we formulate the necessary efficiency conditions for the new control model, denoted by (P) , with multiple cost interval-valued functionals. Thereafter, by considering the notions of T -convexity and T -pseudoconvexity, we formulate a characterization result of the saddle-point for a Lagrange functional associated with (P) . In addition, we establish sufficient efficiency conditions for (P) via the modified T -objective functional approach. Finally, under suitable generalized convexity assumptions, we state the connection between an LU -efficient solution for (P) and a saddle-point for the Lagrange functional

associated with the modified control model.