



SCIENTIFIC PROGRAM

**New Trends in the Applications of Differential Equations in
Sciences (NTADES'24)**

**7-10 July, 2024, St. Constantine and Helena
Bulgaria**

Funded by project KP-06-MNF/2



Sunday, July 7th

- 9:00–9:30 **REGISTRATION AND OPENING**
- 9:30-13:00 **SESSION 1: APPLICATIONS IN MATHEMATICAL PHYSICS**
Chair: Petar Popivanov
- 9:30-10:30 *Invited Plenary Talk*
Vladimir Georgiev, *Sobolev spaces for singular perturbation of Laplace operator*
- 10:30 – 11:00 **Coffee Break**
Chair: Angela Slavova
- 11:00 – 11:30 Petar Popivanov, Angela Slavova, *Exact travelling wave solutions to several fully nonlinear PDE and radial solutions of boundary value problem to the Liouville equation in circular domains in the plane*
- 11:30- 12:00 Ivan P. Jordanov, *An Application of the Method of Simplest Equation for Exact Real Solutions of the Model for Spatial-Time Interaction of Populations*
- 12:00 – 12:30 Vladimir Kotev, Georgi Ivanov, Galina Koteva, *An education toll for design and mathematical modeling of 4 bar linkage mechanism*
- 12:30- 13:00 Ivan P. Jordanov, Radoslav G. Nikolov , Elena V. Nikolova, *Exact solitary wave solutions of several fractional evolution equations in shallow water theory*
- 13:00 – 14:00 **Lunch Break**

14:00-15:00 **SESSION 2: APPLICATIONS IN MATHEMATICAL PHYSICS**

Chair: Elena Nikolova

14:00 – 14:30 Petar Popivanov, Angela Slavova, *Exact solutions of the Troesch's problem*

14:30- 15:00 Tzanko Donchev, Jamil Abbas, Alina I. Lazu, Nonlinear parabolic systems with mixed semicontinuity

15:00 – 15:30 ***Coffee Break***

15:30 – 17:00 **SESSION 3: APPLICATIONS IN MATHEMATICAL PHYSICS**

Chair: Ivan Jordanov

15:30 – 16:00 Alexandr Bugay, Nikolay Ustinov, Zlatinka I. Dimitrova, Kaloyan N. Vitanov, *On nonlinear waves in microtubules generated by means of a simple equation of Bernoulli kind*

16:00 – 16:30 Saba Iftikhar, Tzanko Donchev, Dimital Kolev, Alina I. Lazu, *On a mathematical model describing pollution processes in a channel*

16:30 – 17:00 Nikolay K. Vitanov, *Recent developments in the methodology of the Simple Equations Method (SEsM) for obtaining exact solutions of nonlinear differential equations*

17:00-19:00 **SESSION 3: APPLICATIONS IN MATHEMATICAL PHYSICS**

Chair: Zlatinka Dimitrova

17:00 – 17:30 Pavlina Atanasova, Valentin Georgiev, *On the Special Cases of the Jacobi Elliptic Function Solutions of the $(2+1)$ -dimensional Sine-Gordon Equation*

17:30 – 18:00 Teodora Zapryanova, *A Characterization of the K-functional for the Algebraic Version of the Trigonometric Jackson Integrals $G_{s,n}$ in Weighted Integral Metric*

18:00 – 18:30 Jamil Abbas, Tzanko Donchev, Alina I. Lazu, Iveta Nikolova,
Forward stability conditions and applications

18:30 – 19:00 Zlatinka I. Dimitrova, Nikolay Ustinov, Alexandr Bugay, *On
nonlinear waves in microtubules generated by means of a linear
simple equation*

19:00 ***Welcome party***

Monday, July 8th

9:30-10:30 **SESSION 4**

Chair: Angela Slavova

9:30 – 10:30 *Invited Plenary Talk*

Li Ma, *Ground states of Schrödinger- Poisson- Slatter equations with linear non-local terms*

10:30 – 11:00 ***Coffee Break***

11:00-13:00 **SESSION 5: APPLICATIONS IN MECHANICS**

Chair: Angela Slavova

11:00 – 11:30 Yoshihiro Mochimaru, *Analysis of Non-periodic Buckling in an Axisymmetric Thin Uniform Shell*

11:30 – 12:00 Nikolay K. Vitanov, Aleksandr N. Bugay, *On nonlinear waves in microtubules*

12:00 – 12:30 Martina Langerova, *On solutions of beam equation with impulses*

12:30 – 13:00 Vladimir Kotev, Gergana Nikolova, Daniel Dantchev, Mihail Tsveov, *A kinematic model of walking based on data of the average Bulgarian man*

13:00 – 14:00 ***Lunch Break***

14:30 – 16:30 **SESSION 6: APPLICATIONS IN FINANCIAL MATHEMATICS**

Chair: Angela Slavova

14:30-15:00 Iliana Raeva, Borislav Chakarov, *Multicriteria Optimization*

Approach for Investment Project Financing Evaluation and Decision Making

- 15:00-15:30 Vilislav Boutchaktchiev, *A value-weighted test for the validation of loss-default estimation*
- 15:30 – 16:00 Maya Markova, *A Comparison of Deep neural network and Convolutional Neural Network for Credit Card Fraud Detection*
- 16:00 – 16:30 Pavlina K. Jordanova, Evelina Veleva, Milan Stehlik, *Mixed Poisson process with Min-U-Exp mixing variable*
- 16:30 – 17:00 ***Coffee Break***
- 17:00-18:30 **SESSION 7: APPLICATIONS IN MATHEMATICAL BIOLOGY**
Chair: Nikolay Vitanov
- 17:00-17:30 Zlatinka I. Dimitrova, *Comparison of exact solutions of model equations connected to the SIS and SIR model of epidemics spread*
- 17:30- 18:00 Radoslav G. Nikolov, Vilislav N. Boutchaktchiev, Elena V. Nikolova, *Nonlinear waves in the reaction-diffusion model of interacting populations incorporating nonlocal effects and long range diffusion*
- 18:00 – 18:30 Zlatinka I. Dimitrova, *Influence of presence of exposed individuals on the characteristics of an epidemic wave*

Tuesday, July 9th

9:30-10:30 **SESSION 8:**

Chair: Angela Slavova

Invited Plenary Talk

Joël Chaskalovic, *An improved interpolation error estimate from a new Taylor-like formula: Application to finite element method*

10:30 – 11:00 ***Coffee Break***

11:00-13:00 **SESSION 9: APPLICATIONS IN NUMERICAL METHODS**

Chair: Yoshihiro Mochimaru

11:00 – 11:30 Andrey B. Andreev, Milena R. Racheva, *Mixed FEM Applied to Sixth-order Eigenvalue Problem*

11:30-12:00 Nikolay Kyurkchiev, Tsvetelin Zaevski, Anton Iliev, Veselin Kyurkchiev, Maria Vasileva, Asen Rahnev, *Dynamics of a class of modified escape oscillators: simulations, applications*

12:00-12:30 Venelin Todorov, Slavi Georgiev, Stoyan Apostolov, *Advanced unbiased Monte Carlo for multidimensional Fredholm integral equations*

12:30-13:00 Angela Slavova, Ventsislav Ignatov, *Physics informed neural networks for studying nonlinear partial differential equations*

13:00 – 14:00 ***Lunch Break***

14:00-15:00 **SESSION 10**

Chair: Angela Slavova

Invited Plenary Talk

Alon Ascoli, *Edge of Chaos Theory Reveals how a Simple*

Memristor Circuit Can Reproduce Qualitatively All the Fundamental Bifurcations in the Life Cycle of a Neuronal Action Potential

15:00 – 15:30 **Coffee Break**

15:30- 17:00 **SESSION 11: APPLICATIONS IN FINANCIAL MATHEMATICS**

Chair: Evelina Veleva

15:30-16:00 Vesela Mihova, Velizar Pavlov, Blagovesta Petrova, *Studying the dependency between household income and consumption of basic food commodities in Bulgaria*

16:00- 16:30 Teodora Klimenko, Velizar Pavlov, *Accurate lattice-based models for pricing European options*

16:30- 17:00 Venelin Todorov, *Advanced Monte Carlo optimizations for multi-dimensional European style options*

17:00-19:00 **SESSION 12: APPLICATIONS IN NUMERICAL METHODS**

Chair: Milena Racheva

17:00-17:30 Venelin Todorov, Stoyan Apostolov, Slavi Georgiev, Ivan Dimov, *Stochastic approaches for linear systems of integral equations*

17:30-18:00 Venelin Todorov, Slavi Georgiev, Stoyan Apostolov, *Advanced stochastic method for linear algebraic systems*

18:00 – 18:30 Venelin Todorov, *Novel stochastic sequences for multidimensional air pollution modelling*

18:30 -19:00 Pavlina Atanasova, Valentin Georgiev, *Numerical Analysis of a Difference Scheme Family for Solving Semilinear Hyperbolic PDEs*

20:00 **Official Dinner**

Wednesday, July 10th

9:30-10:30 **SESSION 14**

Chair: Angela Slavova

Invited Plenary Talk

Ronald Tetzlaff, *Edge of chaos theory in memristive circuits*

10:30 – 11:00 ***Coffee Break***

11:30 – 13:00 **SESSION 15: APPLICATIONS IN FRACTIONAL ANALYSIS**

Chair: Tzanko Donchev

11:30 – 12:00 Snezhana Hristova, *Ulam type stability of Volterra fractional integral equations of variable-order*

12:00 – 12:30 Olga Kichmarenko, Kyrylo Bondarenko, Petko M. Kitanov, *Approximate solution of the optimal control problem with the Hukuhara derivative equation with rapidly fluctuating coefficients on a finite interval*

12:30- 13:00 Snezhana Hristova, Mohammed Said Soud, *Existence for a nonlinear boundary value problem for Riemann-Liouville fractional differential equations of variable order*

13:00 – 14:00 ***Lunch Break***

14:00 – 18:00 ***Excursion***