Dynamical Systems and Applications VI, DSA 2024

In honor of Prof. Avner Friedman on his 90th birthday

June 26-28, 2024, Lodz, Poland

PROGRAM

Lodz University of Technology

We acknowledge the financial support of the co-organizing institutions: the **Lodz University of Technology** (the host), the **University of Warsaw, AGH University of Science and Technology**, and the **University of Lodz**. The conference was also supported by the program Excellence Initiative at the **Jagiellonian University in Krakow**.

UNIVERSITY OF WARSAW

UNIVERSITY OF LODZ

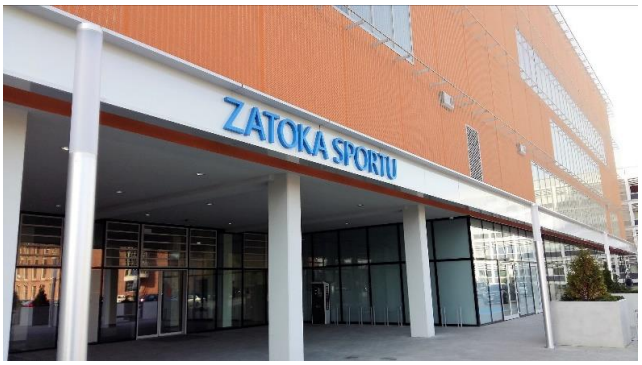
JAGIELLONIAN UNIVERSITY IN KRAKÓW

AGH

Venue: Lodz University of Technology, Institute of Physics, ul. Wolczańska 217/221, 93-005 Łódź

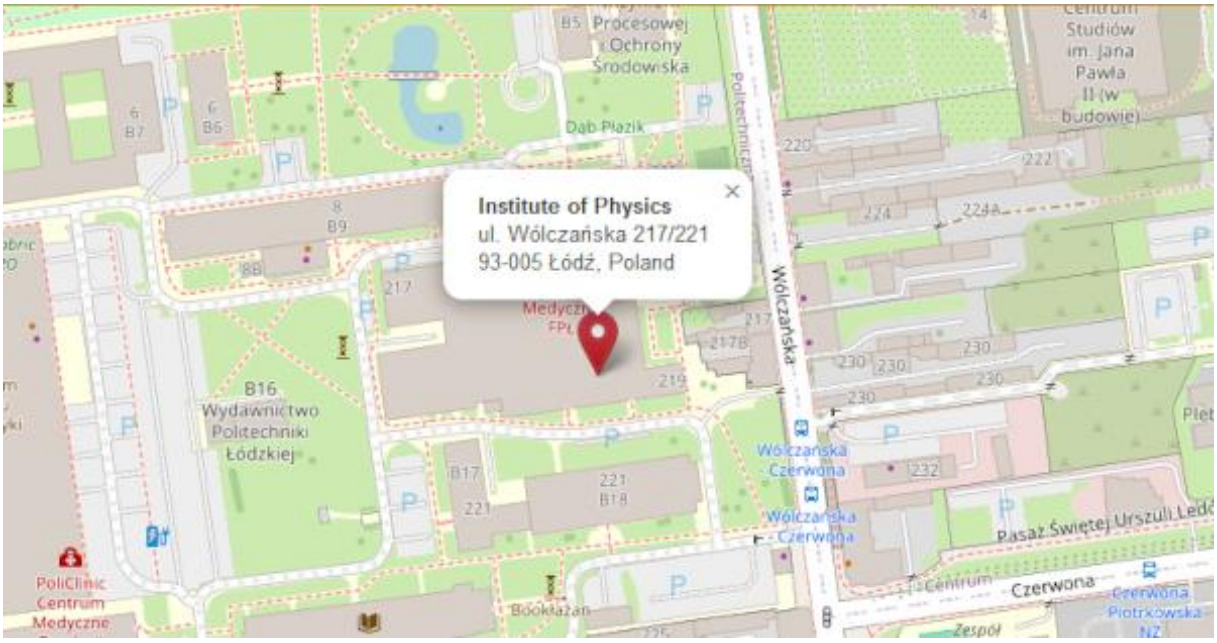
All the lectures and Welcome Reception will be held in the

Institute of Physics, B14



All lunches and Banquet will be held in the **Sport Complex, "Zatoka Sportu" B28**

Below is a map of Lodz University of Technology.



WEDNESDAY

8.50-9.05 (Aula Major 0.4), Opening remarks

9.05-9. 50 (Aula Major 0.4) – Chair: Urszula Ledzewicz
Keynote Address: Avner Friedman, Ohio State University, USA,
Mathematical Biomedicine: Examples

9.55- 10.35 (Aula Major 0.4) – Chair: Bozenna Pasik-Duncan
Plenary Talk: Irena Lasiecka, University of Memphis, USA,
Can we control oscillations in flow-structure interactions?

10.40-11.00 (Room 0.25) Coffee Break

Session 1: Dynamical Systems in Biology and Medicine

(Aula Major 0.4), Organizers: Urszula Foryś and Agnieszka Bartłomiejczyk

11.00 - 11.20 – **Eugene Kashdan, University College Dublin, Ireland**,
Turning data into a story: investigating connection between human papilloma virus (HPV) and oropharyngeal cancer
11.25-11.45 – – **Najat Ziyadi, Morgan State University, USA**,
A mathematical model of human papillomavirus (HPV) and cervical cancer with application
11.50-12.10 – **Urszula Ledzewicz, Lodz University of Technology, Poland & Southern Illinois University Edwardsville, USA,**
Analysis of a Mathematical Model for Low-Grade Glioma under Chemotherapy as a Dynamical System
12.15-12.35 – **Yuri Kogan, IMBM, Israel**,
Combining dynamic modelling, expectation-maximization and machine learning for predicting individual response to immunotherapy in patients with advanced melanoma
12:40-13:00 – **Mariusz Bodzioch, University of Warmia and Mazury in Olsztyn, Poland**,
Optimal control of treatment in a mathematical model of neuroblastoma dynamics

Session 2: Differential Equations, Inequalities, and their Multifaceted Applications

(Aula Minor 0.8), Organizers: Anna Ochal and Wojciech Kryszewski

11.00 - 11.20 – Jeff Webb, University of Glasgow, United Kingdom, Nonexistence results for fractional differential inequalities
11.25-11.45 – Stefan Kromer, UTIA, Czech Academy of Sciences, Czech Republic,
Nonlinear elasticity: a new Lavrentiev phenomenon caused by impenetrability conditions
11.50-12.10 – Aleksander Ćwiszewski, Nicolaus Copernicus University Poland,
Standing waves for nonlinear Schroedinger equations and Kato-Rellich potential

12.15-12.35 – Josef Diblik, Central European Institute of Technology, Brno University of Technology, Czech Republic
Vanishing and blow-up solutions to a nonlinear complex differential equation near the singular point
12.40-13.00 – **Elżbieta Ratajczyk, Lublin University of Technology, Poland**,
Thin layer approximation for a coupled bulk-surface PDE

Session 5: Stochastic Processes with Applications

(Room 1.05), Organizers: Bozenna Pasik-Duncan and Żywilla Fechner

11.00 - 11.20- **Jacek Jakubowski, University of Warsaw, Poland**,
On bivariate distributions of the local time of Ito-McKean diffusions
11.25-11.45 - **Anna Jaśkiewicz, Wrocław University of Science and Technology, Poland**,
On Markov Perfect Equilibria in Discounted Stochastic ARAT Games
11.50-12.10 - **Petr Čoupek, Charles University, Czech Republic**,
Besov-Orlicz path regularity of stochastic processes
12.15-12.35 - **Adam Bobrowski, Lublin University of Technology, Poland**, A kinetic model approximation of Walsh's spider process on star-like graph
12:40-13:00 - **Lesław Gajek and Marcin Rudź, Lodz University of Technology, Poland,**
Applications of the Banach fixed point theorem to analyze insolvency problems of an insurance company

13.10-14.10 (Sport Complex B28) Lunch

14.15 -14.55 (Aula Major 0.4), Chair: Łukasz Stettner
Plenary Talk: Tyrone Duncan, University of Kansas, USA,
Some Properties of Rosenblatt Processes

Session 1: Dynamical Systems in Biology and Medicine

(Aula Major 0.4), Organizers: Urszula Foryś and Agnieszka Bartłomiejczyk

15.00 - 15.20 – **Artur Luczak, University of Lethbridge, Canada**, Dynamics in neural networks composed of predictive neurons
15.25-15.45 - **Piotr Bartłomiejczyk, Gdańsk University of Technology, Poland**, Neuron modeling via Lorenz maps
15.50-16.10 – **Justyna Signerska-Rynkowska, Dioscuri Centre in TDA, IM PAN, Poland**,
A new insight into the dynamics of the Chialvo model

16.15-16:35 (Room 0.25) Coffee Break

16:35-16:55 – **Piotr Kowalczyk, Wrocław University of Science and Technology, Poland**,
Dynamics and bifurcations in a conductance-based neuron model

17:00-17:20 – **Krzysztof A. Topolski, Polish Naval Academy, Poland**, Population of entities with three individual states and asymmetric interactions
17:25-17:45 – **Aleksandra Puchalska, University of Warsaw, Poland**, Biomass' flow modelling in ecological networks with higher order interactions
17:50- 18:10 – **Monika J. Piotrowska, University of Warsaw, Poland**, Reducing the Spread of Drug-resistant Bacteria in the Healthcare Network Using Mathematical Modelling Approach
18:15-18:35 – **Agata Lonc, University of Warsaw, Poland**,
Analysis of models describing a pathogen spread in a hospital network

Session 2: Differential Equations, Inequalities, and their Multifaceted Applications

(Aula Minor 0.8), Organizers: Anna Ochal and Wojciech Kryszewski

15.00 - 15.20 – Piotr Kalita, Jagiellonian University, Poland,
Structural stability of global attractors for a gradient ODE with delay
15.25-15.45 – Mirosława Zima, University of Rzeszow, Poland,
Multiplicity results for resonant boundary value problems
15.50-16.10 – Marta Kornafel, Krakow University of Economics, Poland,
Economic growth and natural capital maintenance – dynamic model

16.15-16:35 (Room 0.25), Coffee Break

16:35-16:55 – Natnael Gezahegn Mamo, University of Trieste, Italy,
Multiplicity results for Hamiltonian systems with Neumann-type conditions
17:00-17:20 – Andrzej Myśliński, Polish Academy of Sciences, Poland
Sharp-interface approach to topology optimization problems constrained by variational inequalities
17:25- 17:45 – Gabriela Vazanova, Brno University of Technology, Czech Republic,
Bounds for global and semi-global solutions to functional differential equations
17:50- 18: 10 – Krzysztof Bień, AGH University of Krakow, Poland,
Multiple solutions for a perturbed Dirichlet problem
18:15- 18: 35– Witold Majdak, AGH University of Krakow, Poland,
Parametric singular problems with an indefinite perturbation

Session 3: Dynamical Systems in Engineering

(Room 1.04), Organizers: Przemysław Perlikowski and Tomasz Kubiak

15.00 - 15.20 – Martyna Sedlmayr, Lublin University of Technology, Poland, Energy efficiency of the Duffing system with a potential disturbed by a harmonic oscillator
15.25-15.45 – Andrzej Rysak, Lublin University of Technology, Poland, Study of the energy efficiency of the fractional Duffing system with positive linear elasticity
15.50-16.10 – Wojciech Szuminski, University of Zielona Gora, Poland,
The dynamics and integrability of multiple pendula

16:15-16:35 (Room 0.25), Coffee Break

16:35-16:55 – Dawid Dudkowski, Lodz University of Technology, Poland,
Basin stability for updating system uncertainties
17:00-17:20 – Pawel Olejnik, Lodz University of Technology, Poland,
Estimating the static friction law of a forced double torsion pendulum using physics-informed neural networks
17:25- 17:45 – Muhammad Umer, Lodz University of Technology, Poland,
Dynamical Analysis of Optical Soliton Patterns in the Flexibly Supported Euler-Bernoulli Beam Equation: A Semi-Analytical Solution Approach inequalities
17:50-18:10 – Tomasz Kubiak, Lodz University of Technology, Poland,
The behaviour of thin composite plates with extension-bending coupling under harmonic compressive load
18:15-18:35 – Przemysław Perlikowski, Lodz University of Technology, Poland,
Dynamics and multistability of Church Bells

Session 4: Control of Dynamical Systems with Applications

(Arena Magica 0.17), Organizers: Maria de Rosario do Pinho and Witold Respondek
15.00 - 15.20 - Bronislaw Jakubczyk, Polish Academy of Sciences, Poland,
Curvature and control of trajectories of second order ODEs
15.25-15.45 - Bronislaw Jakubczyk, Polish Academy of Sciences, Poland,
Conjugate points and curvature in nonlinear control systems
15.50-16.10 - Ellina Grigorieva, Texas Woman's University, USA,
Bilinear controlled model in adaptive cancer therapy

16.15-16:35 (Room 0.25) Coffee Break

16:35-16:55 - Franco Rampazzo, University of Padova, Italy,
On the use of Lie brackets in the presence of state constraints
17:00-17:20 - Heinz Schaettler, Washington University, USA,
Time Optimal Control of Ermakov's Equation, part I
17:25- 17:45 - Heinz Schaettler, Washington University, USA,
Time Optimal Control of Ermakov's Equation, part II
17:50- 18:10 – Marcin Nowicki, Poznan University of Technology, Poland,
Linearization of Mechanical Control Systems,
18:15- 18:35 – Andrzej Nowakowski, University of Lodz, Poland,
Optimality conditions for finite-time and fixed-time stability of time-varying impulsive differential equations

18:40-20:00 (Patio, Ground Floor) WELCOME RECEPTION

THURSDAY

9.00-9.40 (Aula Major 0.4)– Chair: Avner Friedman
Plenary Talk: Philip Maini, University of Oxford, UK,
Modelling Cancer Cell Invasion

9.45- 10:25 (Aula Major 0.4), Chair: Eugene Kashdan
Plenary Talk: Frederic Dias, University College Dublin , Ireland , ENS Paris-Saclay, France,
Applications of dynamical systems to water waves

10:30-10:50 (Room 0.25) Coffee Break

Session 1: Dynamical Systems in Biology and Medicine

(Aula Major 0.4), Organizers: Urszula Foryś and Agnieszka Bartłomiejczyk

10.50 - 11.10 – Tomasz Lipniacki, Institute of Fundamental Technological Research, Poland,
Nonself RNA rewires IFN-β signaling: A mathematical model of the innate immune response
11.15-11.35 – Jarosław Śmieja, Silesian University of Technology, Poland,
A framework for modeling immunotherapy and analysis of survival
11.40-12.00 – Jacek Banasiak, Łódź University of Technology, Poland & University of Pretoria, South Africa,
Asymptotic analysis and monotone systems in malaria analysis
12.05-12.25 – Torsten Lindstrom, Linnaus University, Sweden, On the stochastic engine of contagious diseases in exponentially growing populations
12:30-12:50 – Marcin Choiński, Warsaw University of Life Sciences, Poland,
A Discrete SIS Model of Epidemic for Heterogeneous Population without Discretization of its Continuous Counterpart

Session 2: Differential Equations, Inequalities, and their Multifaceted Applications

(Aula Minor 0.8), Organizers: Anna Ochal and Wojciech Kryszewski

10.50 - 11.10 – Gennaro Infante, Universit`a della Calabria, Italy,
Birkhoff-Kellogg type results with applications
11.15-11.35 – Krzysztof Bartosz, Jagiellonian University, Poland, Existence of a weak solution for a dynamic adhesive Signorini's contact problem
11.40-12.00 – Aleksandra Orpel, University of Lodz, Poland,
Monotonic sequences of minimal solutions for a certain class of elliptic systems
12.05-12.25 – Piotr Kasprzak, Adam Mickiewicz University in Poznan, Poland,
Boundary value problems with non-local conditions
12:30-12:50 – Grzegorz Gabor, Nicolaus Copernicus University, Poland,
Periodic solutions for impulsive differential inclusions with state dependent impulses

Session 5: Stochastic Processes with Applications

(Room 1.05), Organizers: Bozenna Pasik-Duncan and Żywilla Fechner

10.50 - 11.10 - **Łukasz Stettner, Institute of Mathematics PAS, Poland**,
On several time inconsistent stochastic control problems, part I
11.15-11.35 - **Łukasz Stettner, Institute of Mathematics PAS, Poland**,
On several time inconsistent stochastic control problems, part II
11.40-12.00 - **Mariusz Niewęgłowski, Warsaw University of Technology, Poland**,
Multivariate Hawkes Processes and Markovianizations
12.05-12.25 -**Grzegorz Krzyżanowski, Wroclaw University of Science and Technology, Poland**
Black-Scholes Model on Non-liquid Markets
12:30-12:50 - **Elżbieta Motyl, University of Lodz, Poland**,
Stochastic Hall-magneto-hydrodynamics equations

13:00-14:00 (Sport Complex B28) Lunch

14.00-14:40 (Aula Major 0.4), Chair: Urszula Foryś

Plenary Talk: Zvia Agur, Institute for Medical BioMathematics, IMBM, Israel,
Self-Amplified Glycolysis Underlies COVID-19 Deaths as interpreted from the Dynamics of Blood Variables

14:45- 16:00 (Patio, Ground Floor) Poster Session with Coffee and Pastry

For the **List of Poster Presentations** see the last page of the program.

16.00-16.40 (Aula Major 0.4), Chair: Irena Lasiecka

Plenary Talk: Bozena Pasik-Duncan, University of Kansas, USA,

Stochastic Adaptive Control - Its Central Role in Interdisciplinary Research

16:45- 17:25 (Aula Major 0.4), - Chair: Tomasz Kubiak

Plenary Talk: Lukasz Jankowski, Institute of Fundamental Technological Research Polish Academy of Sciences, Poland,

Computationally efficient optimal sensor placement

17:30 -18:30 (Aula Major 0.4), Panel Discussion: Current and Future Directions in Application of Dynamical Systems in Other Fields

Panel Coordinators: Urszula Ledzewicz and Avner Friedman

Panel Members: Zvia Agur, Frederic Dias, Łukasz Jankowski, Tomasz Lipniacki, Philip Maini, Bozenna Pasik-Duncan, Heinz Schaettler, Łukasz Stettner, Andrzej Swierniak

18:35 – 21:00 BANQUET (Sport Complex B28)

Announcement of the Winners of the Best Poster Award Competition

Presentation of Diplomas to the Winners of the Competition for the Best Ph. D Thesis in Applied Mathematics

Presenters: Adam Bobrowski, Urszula Ledzewicz, Avner Friedman

Winners: VI Edition: Adam Błoch, Mateusz Dębowski, V Edition: Szymon Cygan, Grzegorz Krzyżanowski, I Edition: Elżbieta Ratajczyk

FRIDAY

8.15-8.55 (Aula Major 0.4) Chair: Przemysław Perlikowski
Plenary Talk: Krzysztof Kęcik, Lublin University of Technology, Poland,
A comprehensive study on energy harvesting from nonlinear dynamical systems

Session 1: Dynamical Systems in Biology and Medicine

(Aula Major 0.4), Organizers: Urszula Foryś and Agnieszka Bartłomiejczyk

9.05 - 9.25 – Andrzej Świerniak, Silesian University of Technology, Poland,
Positive (but not only) feedbacks in mathematics of aging
9.30-9.50 – **Krzysztof Fujarewicz, Silesian University of Technology, Poland,**
Mathematical Modeling of Cytosine Demethylation

9.55-10:15 (Room 0.25) Coffee Break

10.15-10.35 – Mirosław Lachowicz, Warsaw University, Poland,
Nonlocal movement I
10.40-11.00 – Mirosław Lachowicz, Warsaw University, Poland,
Nonlocal movement II
11:05-11:25 – Bogdan Kaźmierczak, Institute of Fundamental Technological Research, Poland,
Effect of buffers with multiple binding sites on calcium waves
11:30-11:50 – Mateusz Dębowski, University of Warsaw, Poland,
Some Aspects of Molecular Mechanisms of the Cell Cycle and Diauxic Growth from a Mathematical Perspective

Session 2: Differential Equations, Inequalities, and their Multifaceted Applications

(Aula Minor 0.8), Organizers: Anna Ochal and Wojciech Kryszewski

9.05 - 9.25 – Robert Skiba, Nicolaus Copernicus University, Poland,
Global and local bifurcations of homoclinic solutions
9.30-9.50 – Wahid Ullah, University of Trieste Italy,
Boundary value problems associated with Hamiltonian systems coupled with positively-(p, q)-homogeneous systems

9.55-10:15 (Room 0.25) Coffee Break

10.15-10.35 – Dariusz Idczak, University of Lodz, Poland,
Fractional Sobolev-type spaces of functions of two variables and their application to partial differential equations

10.40-11.00 – Michal Bełdziński, Lodz University of Technology, Poland,
The role of M-matrices in the study of nonlinear operator systems via monotone operators methods
11.05-11.25 – Adam Błoch, Lodz University of Technology, Poland
First-order wave equations on networks
11.30-11.50 – Igor Kossowski, Lodz University of Technology, Poland,
The Dirichlet problem with the competing (p, q)–Laplacian with unbounded weight

Session 4: Control of Dynamical Systems with Applications

(Arena Magica 0.17), Organizers: Maria de Rosario do Pinho and Witold Respondek

9.05 - 9.25 – Pawel Nurowski, Polish Academy of Sciences, Poland,
Parabolic geometry of a car
9.30-9.50 – **Marek Majewski, University of Lodz, Poland,**
Necessary optimality condition for Lagrange problem with fractional partial system

9.55-10:15 (Room 0.25) Coffee Break

10.15-10.35 – Sofia Oliveira Lopes, University of Minho, Portugal,
Irrigation problem with cost L^1 and cost L^2
10.40-11.00 – Radoslaw Matusik, University of Lodz, Poland,
Game theory and dual approach to the dynamic programming on the example of the COVID-19 pandemic in Poland described by mathematical model with three-dose vaccinated
11:05-11:25 – Maria do Rosário de Pinho, University of Porto, Portugal,
Optimal Control: a journey in sweeping systems and approximations.
11:30-11:50 – Witold Respondek, INSA de Rouen,
Quadratic nonholonomic constraints

12:00 -12:40 – **(Aula Major 0.4),** Chair: Marek Galewski
Plenary Talk: Vicentiu Radulescu, AGH University of Krakow, Poland, University of Craiova, Romania,

12:45 -12:55 (Aula Major 0.4), Closing Remarks

13:00-14:15 (Sport Complex B28) Lunch and Farewell Reception

14:20 -18:00 SIGHTSEEING EXCURSION LODZ
For more details see link "Social Program" on the Website

POSTER SESSION: Dynamical Systems and Applications

1. **Wiktor Burakowski, University of Lodz, Poland**, Minimal solutions for a certain class of elliptic problems in exterior domains
2. **Volodymyr Denysenko**, **University of Lodz, Poland**, New indicator for the fastest detection of patterns existing in dynamic complex networks of coupled oscillators
3. **Krzysztof Garbowski, University of Lodz, Poland**, Positive solutions for singular elliptic problems
4. **Wiktor Jochymczyk, University of Warsaw, Poland**, Simplified model of immunotherapy for glioblastoma multiforme: cancer stem cells hypothesis perspective
5. **Lyudmyla Kirichenko, Lodz University of Technology, Poland,** Deep Learning Approach for Noise Detection in Chaotic Dynamics
6. **Kamil Kołodziejski, Lodz University of Technology, Poland**, Oversampling of matrix-valued autoregressive model
7. **Sheng-Jie Li, Polish Academy of Sciences, Poland**, Stabilization of a weak viscoelastic wave equation with variable coefficients and an interior delay under nonlinear boundary dissipation
8. **Barbara Lupinska, University of Bialystok, Poland**, Existence and non-existence results for higher order fractional boundary value problem
9. **Kalina Nec, University of Warsaw, Poland**, Mathematical modelling of hysteresis in the epithelial-mesenchymal transition
10. **Urszula Ostaszewska,University of Bialystok, Poland**, Existence of solutions to nonlinear 2nth-order discrete boundary value problem with parameter dependence
11. **Michał Palczewski, Gdansk University of Technology, Poland**, Exploring Chaotic Dynamics in Gene Expression Model
12. **Filip Pietrusiak, Lodz University of Technology, Poland**, Minimization principle for hemivariational-variational inequality driven by uniformly monotone operators with application to problems in contact mechanics
13. **Michał Różański, Silesian University of Technology, Poland**, Monotone approach to the Moreau-Yosida regularization
14. **Robert Stańczy, University of Wroclaw, Poland**, Dynamical System for Tolman-Oppenheimer-Volkoff Equation
15. **Gabriela Szajnowska, University of Rzeszow, Poland**, A fixed point index approach to a third order boundary value problem
16. **Magdalena Szafrańska, University of Warsaw, Poland**, Mathematical Model of Car-T Cell Therapy for Glioblastoma with the Logistic Cancer Growth with Time Delay
17. **Ewa Schmeidel, University of Bialystok, Poland**, Existence of non oscillatory solution on k-dimensional system of delayed nonlinear discrete equations with p-Laplacian
18. **Mengfei Tao, Shandong University of Science and Technology, China**, Existence results for nonhomogeneous fractional Schro¨dinger-Poisson systems involving critical exponents
19. **Filip Turoboś , Lodz University of Technology, Poland**, Usage of Divide-and-Conquer Inverse Reliability Method in Probabilistic Structural Lifetime Prediction
20. **Sergiy Yakovlev, Lodz University of Technology, Poland**, Optimization Methods for Solving Irregular Covering Problem
21. **Malgorzata Zdanowicz, University of Bialystok, Poland**, Existence of solutions to nonlinear 2nth-order discrete boundary value problem via variational methods