Bahçeşehir University, Istanbul, Turkey
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, April 5, 2022**
Time: 14.00-15.00 (Istanbul) = 13.00-14.00 (Ghent) = 17.00-18.00 (Almaty)

Zoom link: https://us02web.zoom.us/j/6678270445?pwd=SFNmQUlvT0tRaH-lDaVYrN3l5bzJVQT09, **Conference ID:** 667 827 0445, **Access code:** 1

Speaker:

Prof. Dr. Eberhard Malkowsky
Department of Mathematics, State University of Novi Pazar, Serbia

Title: Some measures of noncompactness and their applications

Abstract: Measures of noncompactness are very useful tools in functional analysis, for instance in metric fixed point theory and the theory of operator equations in Banach spaces. They are also used in the studies of functional equations, ordinary and partial differential equations, fractional partial differential equations, integral and integro-differential equations, optimal control theory, and in the characterizations of compact operators between Banach spaces. We present an axiomatic introduction to measures of noncompactness on bounded subsets of complete metric spaces [6, 4, 5, 3], and also the alternative axiomatic approaches by Banaś and Goebel [2] and by Akhmerov et al. [1] for measures of noncompactness in Banach spaces. As examples, we consider the Kuratowski, Hausdorff and separation measures of noncompactness and their most important properties. The Kuratowski measure of noncompactness is used in Darbo's fixed point theorem. Furthermore we study the notion of measures of noncompactness of operators between Banach spaces and some of their properties. Finally we give a few applications to the characterization of compact linear operators between certain *BK* spaces and to some results concerning the solvability of integral equations.

References:

[1] R.R. Akhmerov, M.I. Kamenskii, A.S. Potapov, A.E. Rodkina, and B.N. Sadovskii. *Measures of Noncompactness and Condensing Operators*. Birkhäuser Verlag, Basel, 1992.

[2] J. Banaś and K. Goebel. *Measures of Noncompactness in Banach Spaces*, volume 60 of *Lecture Notes in Pure and Applied Mathematics*. Marcel Dekker Inc., New York and Basel, 1980.
[3] B. de Malafosse, E. Malkowsky, and V. Rakočević. *Operators Between Sequence Spaces and Applications*. Springer, 2021.
[4] E. Malkowsky and V. Rakočević. *An introduction into the theory of sequence spaces and measures of noncompactness*, volume 9(17) of *Zbornik radova, Matematčki institut SANU*, pages 143–234. Mathematical Institute of SANU, Belgrade, 2000.
[5] E. Malkowsky and V. Rakočević. *Advanced Functional Analysis*. Taylor and Francis, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487, USA, 2019.
[6] J.M. Ayerbe Toledano, T. Dominguez Benavides, and G. Lopez Acedo. *Measures of Noncompactness in Metric Fixed Point Theory*, volume 99 of *Operator Theory Advances and Applications*. Birkhäuser Verlag, Basel, Boston, Berlin, 1997.

Biography:

Eberhard Malkowsky is a retired Full Professor of Mathematics. He is currently a researcher for the Department of Mathematics at the State University in Novi Pazar, Serbia, and a member of the research project Matrix Transformations, Theory of Fixed Points and Applications (O–01–17) of the Niš section of the Serbian Academy of Sciences and Arts (SANU). He obtained his Ph.D. degree and habilitation at the Department of Mathematics of the Justus-Liebig Universitat Giessen in Germany in 1982 and 1988, respectively; the titles of his theses were *Toeplitz-Kriterien für Matrizenklassen bei Räumen absolut und stark limitierbarer Folgen*, and *Matrix Transformations in a New Class of Sequence Spaces that Includes Spaces of Absolutely and Strongly Summable Sequences*. He was a visiting professor at several universities in various countries including the USA, France, Hungary, India, Iran, South Africa and Turkey. Furthermore, he participated as an invited or keynote speaker in numerous international scientific conferences and congresses. He is a member of the editorial boards of twelve international scientific journals. His list of publications contains more than 175 research papers in international journals. He is the author or co-author of eight books and monographs, and the editor or co-editor of six proceedings of international conferences. He supervised six Ph.D. theses and a great number of B.Sc. and M.Sc. theses in mathematics. His work areas include functional analysis, summability, matrix transformations, measures of noncompactness and operator theory.