Study programme(s): Mathematics (MD)

Level: PhD studies

Course title: Pseudo-analysis (AN-11)

Lecturer: Endre E. Pap

Status: elective

ECTS: 10

Requirements:

Learning objectives

Introduction to a unified theory as a generalization of classical mathematical analysis, based on extension of the usual algebraic operations, and further applications in various fields (nonlinear equations, optimization, multicriterial decision making).

Learning outcomes

Acquiring full knowledge in a contemporary theory as generalization of analysis and its applications.

Syllabus

Semirings on intervals on the real line. Pseudo-integrals, pseudo-convolution and pseudo-Laplace transform. Limit approach to the idempotent case via generated case. Pseudo-linear principle of superposition. Application to nonlinear partial differential equations. Further generalizations. Idempotent semirings. Idempotent algebra and linear algebra. Idempotent measure and Maslovljev integral. Connection between probability theory and optimization theory via idempotent analysis. Idempotent functional analysis. Idempotent principle of superposition and applications to generalized solutions of the Hamilton-Jacobi equations. Applications in optimization theory.

Literature

1) R. Mesiar, E. Pap, Idempotent integral as limit of g-integrals, Fuzzy Sets and Systems 102 (1999), 385-392.

2) V. N. Kolokoltsov, V. P. Maslov, Idempotent Analysis and Its Applications, Kluwer, 1997.

3) F.I. Baccelli, G. Cohen, G. J. Olsder, J. P. Quadrat, Syhchronization and Linearity, J. Wiley&Sons,1992.

4) E. Pap, D. Vivona, Non-commutative and non-associative pseudo-analysis and its applications on nonlinear partial differential equations, J. Math. Anal. Appl. 246 (2000), 390-408.

5) E. Pap, Null-Additive Set Functions, Kluwer Academic Publishers, Mathematics and Its Applications 337, Dordrecht/Boston/London, 1995, 315 pp.

6) G.L. Litvinov, V.P. Maslov , Proceedings of the Conference on Idempotent Mathematics and Mathematical Physics, Contemporary Mathematics 377, American Mathematical Society, 2005.

7) M. Gondran, M. Minoux, Graphes, dioides et semi-anneaux, Editions TEC \& DOC, Londres- Paris-New Yorк, 2001.

8) E. Pap, Handbooк of Measure Theory (37 chapters), Volume I, II, Elsevier, North-Holland,2002, 1636p.

9) V. P. Maslov, S. N. Samborsкii, Idempotent Analysis, AMS, 1992.

Weekly teaching load				Other: 0
Lectures: 2	Exercises 0	Other forms of teaching: 0	Student research: 6	

Teaching methodology

Plenary lectures, problem sessions, independent presentations carried out by students.

Grading method (maximal number of points 100)

Pre-exam obligations	**points**	**Final exam**	**points**
Colloquia	**50**	Oral exam	**50**