Study programme(s): Mathematics (MD)

Level: PhD studies

Course title: Classical measure theory (AN-03)

Lecturer: Endre E. Pap

Status: elective

ECTS: 10

Requirements:

Learning objectives

Introduction to fundaments of classical measure theory and its applications.

Learning outcomes

Acquiring full knowledge in classical measure and integration theory and their applications.

Syllabus

Sigma algebras, measures and measurable functions. Lebesgue integral. Products of measures. L^p spaces and their inclusions. Hilbert structure of L^2 space; Fourier transform in L^2 and Dirichlet principle. Different types of convergence: uniform, pointwise, almost everywhere, in mean, in measure, almost uniform convergence. Vitali covering lemma. Decomposition of measures: Hahn, Jordan and Lebesgue decomposition. Radon-Nikodym derivative. Dual of L^p spaces. Differentiation and integration on the real line: absolutely continuous functions, functions of bounded variation, jump functions. Hardy-Littlewood maximal function. Rectifiable curves and the isoperimetric inequality. Hausdorff measures and fractals. Besicovitch sets and regularity.

Literature

1. S.Pilipović, D.Seleši, *Mera i integral – fundamenti teorije verovatnoće*, Zavod za udžbenike, 2012.
2. P.R.Halmos, *Measure Theory*, D. Van Nostrand Comp., 1954.
3. G.B. Folland, *Real Analysis – Modern Techniques and their Applications*, Wiley, 1984.
4. Stein E.M., Shakarchi M., *Real Analysis: Measure Theory, Integration and Hilbert Spaces*, Princeton University Press, 2005.
5. Fremlin D.H., *Measure Theory*, Volumes I-V, Biddles Short Run Books, King's Lynn, published between 2000 and 2008.
6. Yeh J., *Real Analysis - Theory of Measure and Integration*, World Scien-tic, 2006.
7. Tao T., *An Introduction to Measure Theory*, Graduate studies in Mathe-matics Vol. 126, American Mathematical Society, 2011.

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**