DOCTORAL SCHOOL OF INFORMATICS
COMPLEX EXAM SUBJECT

Fourier anaysis and its applications (main subject)

Orthogonal systems: orthogonal polynomials, trigonometric, Haar-, Rademacher-, Walsh systems, martingales. Wavelets, discrete and continuous versions. Construction of wavelets, applications.

Trigonometric Fourier series and Fourier transforms, inversion formula. Norm and almost everywhere convergence, different summability methods, approximation. Classical and dyadic Hardy spaces, Hilbert transform, atomic decompositions. Interpolation theory of operators. Multi-dimensional theory. Convergence of one- and multi-dimensional Walsh-Fourier series, summability methods.

Discrete systems. Fast Fourier transforms and applications. Periodizational operator, Poisson formula. AD conversion, sampling, Shannon theorem. Uncertainty relations. Filters, window functions, multipliers. Solution of partial differential equations with Fourier method.

References:

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Harmonic Analysis and Applications (Studies in Advanced Mathematics), CRC Press Boca Rota, New York, London, Tokyo, 1996.

Gasquet, C., Witomski, P.
Fourier Analysis and Applications: Filtering, Numerical Computation, Wavelets (Texts in Applied Mathematics 30), Springer New York, 1999.

Grafakos, L.
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Pearson Education, New Jersey, 2004

Schipp, F.; Wade, W. R.; Simon, P. & Pál, J.:Walsh Series: An Introduction to Dyadic Harmonic Analysis.
Adam Hilger, Bristol, New York, 1990

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Kluwer Academic Publishers, Dordrecht, Boston, London, 2002

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