Mathematical Institute
Polish Academy of Sciences

COURSE DESCRIPTION

Course name	Introduction to signal detection and parameter estimation
Course type	reading course (wrd)
Supervisor	Andrzej Królak
ECTS credit allocation	4 – IM PAN Ph. D. program; 6 - recommended for MA programs
Duration	One semester
Number of hours	30
Language	English or Polish, if every participant speaks Polish
Prerequisites	Basic knowledge of probability theory and time series analysis
Course content	Hypothesis testing, parameter estimation: Bayesian approach, maximum likelihood estimators, likelihood ratio tests, Fisher matrix and parameter space geometry. Confidence intervals: Neyman and Feldmans-Cousins approaches. Signal detection as hypothesis testing. Detection and estimation of periodic signals in noise. Introduction to spectrum estimation. Introduction to non-stationary time series.
Recommended reading	1. L. H. Koopmans. The Spectral Analysis of Time Series. Academic Press, New York, 1974. 2. D. B. Percival and A. T. Walden. Spectral Analysis for Physical Applications: Multitaper and Conventional Univariate Techniques. Cambridge University Press, 1993. 3. P. Jaranowski i A. Królak, Analysis of gravitational-wave data, Cambridge University Press, 2009. 4. R.N. McDonough and A.D. Whalen, Detection of Signals in Noise, Academic Press,1995.
Learning outcomes	Participant will gain basic knowledge of tools for time series analysis: spectrum estimation, signal detection and parameter estimation, detection of periodicities.
Assessment methods and criteria	Lists of exercises and exam
Remarks	