DOCTORAL SCHOOL OF INFORMATICS
COMPLEX EXAM SUBJECT

Fractal geometry (recommended subject)

-Hausdorff measure and dimension
-Alternative definitions of dimension
-Different methods of fractal dimension determination (boxcounting, sandbox)
-Local structure of fractals
-Selfsimilar structures, Cantor set
-Julia set, Mandelbrot set
-Multifractal measures
-Random fractal, Brownian motion
-Dynamical system, relative frequency of the periodic and aperiodic orbits, stability, fixpoint, asymptotic trajectory, scaling behaviour, renormalisation, Lyapunov exponent, bifurcation
-Basic idea of chaos, Schwarzian derivative, topological conjugacy
-Ergodic properties, entropy
-Strange attractor, relationship between fractal structure and chaos
-Applications

References:

-Kenneth Falconer, Fractal Geometry, John Wiley & Sons Ltd 1990
-J. Banks, V. Dragan, A. Jones, Chaos, Cambridge Univ. Press 2003
-P. Collet, J. P. Eckmann, Iterated maps on the interval as dynamical systems, Birkhauser 1980
-J. L. McCanley, Chaos, Dynamics and Fractals, Cambridge Univ. Press 1993
-R. L. Devaney, A first course in chaotic dynamical systems, Addison-Wesley Publ. Comp. 1998