## **Chaos and Fractals**

## List of Key Objectives

To achieve the best possible result in your exam you should know about the following topics:

Continuous-time and discrete-time dynamical systems, fixed points, stability of fixed points, periodic orbits, stability of periodic orbits, 1-dim diffeomorphisms and their periodic orbits, Sarkovskii's Theorem, logistic map, period doubling scenario, Feigenbaum constants, Feigenbaum-Cvitanovic equation, tangent bifurcation, intermittency, definition of chaos, Liapunov exponent of a 1-dim map, tent map, Ulam map, binary shift map, topological conjugacy, invariant measures and invariant densities, Perron-Frobenius operator, time and ensemble average, ergodicity, mixing, d-dimensional maps, Jacobi matrix, stability of periodic orbits in d dimensions, Liapunov exponents in d dimensions, Henon map, maps of Kaplan-Yorke type, examples of simple fractals, fractal dimension, multifractals, Renyi dimensions, Julia sets, Mandelbrot sets.