

LTCC Basic Course

Title: Applied Dynamical Systems

Basic Details:

- Core Audience: 1styr applied
- Course Format 5 x 2hr lectures

Course Description:

- Keywords:
basic properties of dynamical systems, definitions of chaos and fractals, applications to statistical physics
- Syllabus:
This course introduces to chaos in dynamical systems and how this theory can be applied to derive fundamental laws of statistical physics from first principles. We start with basic ingredients of nonlinear dynamics by studying topological properties and stability of simple one-dimensional time-discrete maps. We then discuss probabilistic descriptions of dynamical systems, basics of ergodic theory and dynamical entropies. Considering open dynamical systems naturally leads to fractal sets, which we characterise. We then cross-link this theory to statistical physics by discussing simple random walks on the line, their characterisation in terms of diffusion, and the relation to elementary concepts of Brownian motion.
- Recommended reading:
fully worked-out lecture notes will be provided
- Additional Optional reading:
R.L. Devaney, *An Introduction to Chaotic Dynamical Systems* (Westview Press, 2003) ; K.T. Alligood, T.D. Sauer, J.A. Yorke, *Chaos* (Springer, 1996); B. Hasselblatt, A. Katok, *A First Course in Dynamics* (Cambridge Univ Press, 2003)
- Prerequisites:
UG/PGT mathematics

Format:

- No of discussion/problem sheets (typically 4 for with solutions): 4
- Electronic lecture notes (these are strongly encouraged, as they will form the core of the individual study of the students): will be provided
- Necessary support facilities: n/a

Lecturer Details:

- Lecturer: Dr. Rainer Klages
- Lecturer home institution: Queen Mary University of London
- Lecturer e-mail: r.klages@qnul.ac.uk