Topics in non-equilibrium statistical mechanics

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Dates: MON 18 June - FRI 13 July

Times: MON 12-14; WED 10-12; FRI 12-14

Room: FU Berlin, Arnimallee 3, room 005

The goal of this course is to introduce some basic models and techniques for the study of systems that are away from equilibrium. The course will consist of two basic themes: the derivation and the analysis of stochastic equations that describe the dynamics of open systems (i.e. small systems interacting with a thermal reservoir) and the study of nonequilibrium systems that are close to equilibrium using linear response theory.

Prerequisites: Basic ODEs, PDEs, probability theory and stochastic processes. Familiarity with statistical physics is useful but not essential.

Course units: 5

Bibliography:
lecture notes will be provided for all the topics that we will cover.

Assessment: presentation and written report

Detailed course description:
1. Open Classical systems
2. Derivation of the Generalized Langevin Equation (GLE)
3. Markovian approximation of the GLE
4. Ergodic properties and convergence to equilibrium for the GLE.
5. Derivation of the Langevin equation
6. Linear response theory for diffusion processes
7. The Green-Kubo formalism and calculation of transport coefficients