

Module	<i>Econophysics: Non-Equilibrium Statistics</i>
Code	71778
Instruction language	German or English
ECTS credits	6
Credit hours	5
Duration	1 semester
Cycle	Irregularly
Coordinator	Prof. Joachim Ankerhold
Lecturer	Dr. Jürgen Stockburger
Allocation to study programmes	Physics M.Sc., elective module, 1 st or 2 nd semester Wirtschaftsphysik M.Sc., elective module, 1 st - 3 rd semester
Formal prerequisites	None
Recommended prerequisites	Basic knowledge of Probability Theory
Learning objectives	Students who successfully passed this module • know formal methods of advanced statistical physics • are able to apply the learned statistical methods in both scientific and interdisciplinary contexts
Syllabus	Stochastics in economic and physical systems • stochastic processes, Markov chains • Ito processes • application: Black-Scholes theory • physical model: Langevin equation • birth and death processes Dynamics and statistics of open systems • Liouville equation • projector formalism • master equation and Fokker-Planck equation • Open Quantum Systems Solution method • time scale separation and related approximations • path integral methods Elements of Information Theory and applications • basic concepts of Information Theory • relations with the entropy of the thermal statistics • data processing by entropy maximization
Literature	
Teaching and learning methods	Lecture (3 hours per week) Exercise (2 hours per week)

Workload	45 hours lecture (attendance time) 30 hours exercise (attendance time) 105 hours self-study and exam preparation Total: 180 hours
Assessment	Written or oral examination. A prerequisite for the participation in the examination is an ungraded course achievement. Form and scope of the examination and of the course achievement are determined and notified by the lecturer at the beginning of the course.
Examination	12075 Econophysics: Non-Equilibrium Statistics (precourse) 12074 Econophysics: Non-Equilibrium Statistics
Grading procedure	The module grade is the examination grade.
Basis for	Research in the area of Econophysics and Theoretical Physics