Module	***Econophysics: Fundamentals***
Code	71447
Instruction language	German or English
ECTS credits	6
Credit hours	5
Duration	1 semester
Cycle	Irregularly
Coordinator	Dean of Physics Studies
Lecturer	Dr. Jürgen Stockburger
Allocation to study programmes	Physics M.Sc., elective module, 1st or 2nd semester Wirtschaftsphysik M.Sc., elective module, 1st - 3nd semester
Formal prerequisites	None
Recommended prerequisites	Basic knowledge of Probability Theory
Learning objectives	Students, who successfully passed this module, have learned the theoretical foundations for the application of physical concepts in interdisciplinary fields, particularly in economic disciplines.
Syllabus	Advanced Probability Theory • moments, cumulants, generating • multidimensional distributions • modular, shape-stable distributions Time series and correlations • hierarchical characterization of correlations • portfolio Theory • non-linear and non-stationary modelling of time series • scaling behaviour and fat-tailed distributions Stochastic Processes • Markov processes • Martingale • stochastics in physical context • Brownian motion, Ito processes Market pricing models for options and other derivatives • Black-Scholes theory • Risk-neutral valuation, Martingale measures • Binomial Model • Levy financial models • Limitations of the models
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	11991 Econophysics: Fundamentals (precourse) 11990 Econophysics: Fundamentals
Grading procedure	The module grade is the examination grade.
Basis for	Modules *Econophysics: Non-Equilibrium Statistics* and *Econophysics: Numerical Simulation Methods*