Modules:

physics700 Elective Advanced Lectures physics730 Theoretical Physics





Transport in mesoscopic systems (T)

Course No.: physics762

Category	Туре	Language	Teaching hours	СР	Semester
Elective	Lecture with exercises	English	2+1	5	WT/ST

Requirements:

Preparation:

Classical mechanics Elementary thermodynamics and statistical physics (physik521) Advanced quantum theory (physics606) Introductory theoretical condensed matter physics (physics617)

Form of Testing and Examination:

Requirements for the examination (written or oral); successful work with the exercises

Length of Course:

1 semester

Aims of the Course:

Understanding essential transport phenomena in solids and mesoscopic systems Acquisition of important methods for treating transport problems

Contents of the Course:

Linear response theory Disordered and ballistic systems Semiclassical approximation Introduction to quantum chaos theory, chaos and integrability in classical and quantum mechanics Elements of random matrix theory Specific problems of mesoscopic transport (weak localization, universal conductance fluctuations, shot noise, spin-dependent transport, etc.) Quantum field theory away from thermodynamic equilibrium

Recommended Literature:

K. Richter, Semiclassical Theory of Mesoscopic Quantum Systems, Springer, 2000 (http://www.physik.uni-regensburg.de/forschung/richter/richter/pages/research/springer-tracts-161.pdf)
M. Brack, R. K. Bhaduri, Semiclassical Physics, Westview Press, 2003
S. Datta, Electronic Transport in Mesoscopic Systems, Cambridge University Press, 1995
M. C. Gutzwiller, Chaos in Classical and Quantum Mechanics, Springer, New York, 1990
F. Haake, Quantum signatures of chaos, Springer, 2001
M. L. Mehta, Random matrices, Elsevier, 2004
J. Imry, Introduction to mesoscopic physics, Oxford University Press
Th. Giamarchi, The physics of one-dimensional systems, Oxford University Press