Module: Specialization: Advanced Theoretical Physics

Module No.: physics62c

Course: Advanced Theoretical Condensed Matter Physics

Course No.: physics638

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+2	7	ST

Requirements for Participation:

Preparation:
physics617 (Theoretical Condensed Matter Physics)

Form of Testing and Examination:
Requirements for the examination (written): successful work with the exercises

Length of Course:
1 semester

Aims of the Course:
Survey of methods of theoretical condensed matter physics and their application to prominent examples in regard to current research

Contents of the Course:
Bosonic systems:
Bose-Einstein condensation
Photonics

Quantum dynamics of many-electrons systems:
Feynman diagram technique for many-particle systems at finite temperature
Quantum magnetism, Kondo effect, Renormalization group techniques
Disordered systems: Electrons in a random potential
Superconductivity

Recommended Literature:
A. A. Abrikosov, L.P. Gorkov; Methods of Quantum Field Theory in Statistical Physics (Dover, New York 1977)
W. Nolting; Grundkurs Theoretische Physik Band 7: Vielteilchentheorie (Springer, Heidelberg 2002)
A. C. Hewson, The Kondo Problem to Heavy Fermions (Cambridge University Press, 1997)
C. Itzykson, J.-M. Drouffe; Statistical Field Theory (Cambridge University Press 1991)
J. R. Schrieffer; Theory of Superconductivity (Benjamin/Cummings, Reading/Mass, 1983)