

<b>Module:</b>	<b>Specialization: Advanced Theoretical Physics</b>
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<b>Module No.:</b> physics62c
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<b>Course:</b>	 <b>Advanced Theoretical Condensed Matter Physics</b>
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<b>Course No.:</b> physics638
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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)