Condensed Matter Physics - physics613

Degree - M.Sc. in Physics (PO von 2014)

Module	**Specialization: Experimental Physics**
Module No.	physics61a

Course	**Condensed Matter Physics**
Course No.	physics613

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+1	6	WT

Requirements for Participation:

Preparation:

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 of the concepts of condensed matter physics

Contents of the Course:

Crystallographic structures: Bravais lattices, Millers indices, crystallographic defects, structural analysis; Chemical bonds: van der Waals bond, covalent bond, hybridisation, ionic bond, metallic bond, Hydrogen bridge bond;

Lattice vibrations: acoustic and optical phonons, specific heat, phonon-phonon interaction;

Free electrons in the solid state: free electron gas, Drude model, Fermi distribution, specific heat of the electrons;

Band structure: metals, semiconductors, insulators, effective masses, mobility of charge carrier, pn-transition, basic principles of diodes, bipolar and unipolar transistors;

Superconductivity: basic phenomena, Cooper pairs, BSC-theory and its consequences;

Magnetic properties: diamagnetism, Langevin-theory of paramagnetism, Pauli-paramagnetism, spontaneous magnetic order, molecular field, Heisenberg-exchange;

Nuclear solid state physics: Hyperfine interaction, Mössbauer spectroscopy, perturbed angular correlation, positron annihilation, typical applications.

Recommended Literature:

N. W. Ashcroft , N. D. Mermin , Solid State Physics (Brooks Cole 1976) ISBN-13: 978-0030839931

N. W. Ashcroft , N. D. Mermin, Festkörphysik (Oldenbourg 2001) ISBN-13: 978-3486248340

H. Ibach, H. Lüth, Solid-State Physics (Springer 2003) ISBN-13: 978-3540438700

H. Ibach, H. Lüth, Festkörperphysik (Springer 2002) ISBN-13: 978-3540427384

C. Kittel, Einführung in die Festkörperphysik (Oldenbourg 2006) ISBN-13: 978-3-486-57773-5

W. Demtröder, Experimentalphysik, Bd. 3. Atome, Moleküle und Festkörper (Springer 2005) ISBN-13: 978-3540214731

K. Kopitzki, P. Herzog Einführung in die Festkörperphysik (Vieweg+Teubner 2007) ISBN-13: 978-3835101449

L. Bergmann, C. Schaefer, R. Kassing, Lehrbuch der Experimentalphysik 6.: Festkörper (Gruyter 2005) ISBN-13: 978-3110174854

W. Buckel, R. Kleiner, Supraleitung (Wiley-VCH 2004) ISBN-13: 978-3527403486