### Module title
Solid State Physics 2

### Abbreviation
11-FK2B-202-m01

### Module coordinator
Managing Director of the Institute of Applied Physics

### Module offered by
Faculty of Physics and Astronomy

### ECTS
8

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
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### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
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### Contents
1. Electrons in a periodic potential – the band structure
   a. Electrical and thermal transport
   b. Bloch theorem
   c. Electrons
2. Semi-classical models of dynamic processes
   a. Electrical transport in partially and completely filled bands
   b. Fermi surfaces; measurement techniques
   c. Electrical transport in external magnetic fields
   d. Boltzmann-equations of transport
3. The dielectric function and ferroelectrics
   a. Macroscopic electrodynamics and microscopic theory
   b. Polarizability of solids, of lattices, of valence electrons and quasi-free electrons; optical phonons, polaritons, plasmons, inter-band transitions, Wannier-Mott excitons
   c. Ferromagnetism
4. Semiconductors
   a. Characteristics
   b. Intrinsic semiconductors
   c. Doped semiconductors
   d. Physics and applications of p-n junctions
   e. Heterostructures
5. Magnetism
   a. Atomic dia- and paramagnetism
   b. Dia- and paramagnetism in metals
   c. Ferromagnetism
6. Superconductivity
   a. Phenomena
   b. Models of superconductivity
   c. Tunnel experiments und applications

### Intended learning outcomes
Knowledge of effects, concepts and models in advanced solid state physics. Familiarity with the theoretical principles and with applications of experimental methods.

### Courses
(type, number of weekly contact hours, language — if other than German)

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<th>Type</th>
<th>Number of Weekly Contact Hours</th>
<th>Language</th>
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<tr>
<td>V</td>
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<td>German</td>
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<td>English</td>
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Module taught in: German or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes).

If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method
of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: German and/or English
Assessment offered: in semester of module and following semester

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<th>Referred to in LPO I</th>
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<td>Bachelor' degree (1 major) Physics (2020)</td>
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<td>Bachelor' degree (1 major) Nanostructure Technology (2020)</td>
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<td>Bachelor' degree (1 major) Quantum Technology (2021)</td>
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