LEARNING MODULE DESCRIPTION

GENERAL INFORMATION

1. Module title: Solid State Physics II
2. USOS code: 04-F-FCS2-75-3L
3. Term: summer
4. Duration: 30 lectures/ 15 classes
5. ECTS:5 ECTS
6. Module lecturer: Aleksandra Trzaskowska
7. E-mail: olatrzas@amu.edu.pl
8. Language: English

DETAILED INFORMATION

1. Module aim (aims)
   - To introduce students to the structure of solid materials, including defects, material classification, and their properties at an academic level.
   - This lecture aims to provide foundational knowledge on methodologies for studying materials in the condensed phase, increase students' awareness of the importance of solid-phase materials, their range of applications, and potential directions for future development.
   - Additionally, it seeks to equip students with skills to apply the laws of physics in solving relevant problems and to familiarize them with the fundamental phenomenology and properties—particularly those related to electronic origins—of solid-state and condensed-phase systems.

1. Pre-requisites in terms of knowledge, skills and social competences (where relevant)

   The student possesses knowledge in fundamental areas of physics, including mechanics, optics, electricity, and magnetism, at a level corresponding to the completion of the second year of studies in physics or related fields. Additionally, a basic understanding of experimental physics, atomic physics, and quantum physics would be beneficial. The student is expected to have foundational knowledge and problem-solving skills in physics as well as proficiency in mathematical tools. The student can obtain information from various sources and utilize it effectively. Furthermore, the student is capable of working in a team and understands the importance of collaboration.

READING LIST

1. 1. John J. Quinn, Kyung-Soo Yi, Solid State Physics, Principles and Modern Applications Second Edition https://doi.org/10.1007/978-3-319-73999-1
S. M. Girvin, K. Yang, Modern Condensed Matter Physics, Cambridge University Press, DOI: 10.1017/9781316480649
2. J. F. Annett, Superconductivity, Superfluids, and Condensates (Oxford Master Series in Physics), Oxford University Press

SYLLABUS:

Week 1: Crystal lattice vibration
Week 2: Optic and acoustic phonons
Week 3: Elastic properties of crystals
Week 4: Crystal lattice defects and dislocations
Week 5: Dielectric properties
Week 6: Ferroelectric properties
Week 7: Ferroic materials
Week 8: Metals and their properties
Week 9: Semiconductors
Week 10: Methods of crystal investigations
Week 11: Methods of crystal investigations
Week 12: Surface properties of crystals
Week 13: 2d and 3d materials
Week 14: Methods of studies of surface properties
Week 15: Conclusions