

Title:	Elements of solid state physics
Lecture hours:	30
Study period: (summer/winter)	winter
Number of credits:	3
Assessment methods:	The condition for passing the course is obtaining at least 50% of points during the final exam. Assessment criteria: 0-49% unsatisfactory (2) 50-59% satisfactory (3) 60-69% satisfactory+ (3+) 70-79% good (4) 80-89% good+ (4+) 90-100% very good (5)
Language of instruction:	English
Prerequisites:	Knowledge of the basics of mathematical analysis, linear algebra with geometry, general physics, and quantum physics.
Course content:	<ol style="list-style-type: none"> 1. Crystal structure. Basic types of lattice. Indices of crystal planes. 2. Reciprocal lattice. Diffraction on periodic structures. Brillouin zones. 3. Bonds in solids, elasticity. 4. Dynamics of atoms in a crystal. Vibrations of the crystal lattice. 5. Thermal properties of crystals. 6 Fermi gas of free electrons. Heat capacity of electron gas. Electrical conductivity and Ohm's law. 7. Nearly free electrons. Energy gap. Periodic potential. 8. Semiconductors. Electrons and holes. Approximation of effective mass. 9. Fermi surfaces and metals. 10. Optical phenomena and excitons. 11. Superconductivity. BCS theory of superconductivity. High-temperature superconductors. 12. Dielectrics and ferroelectrics. Electrical permeability and polarizability. Structural phase transitions. 13. Diamagnetism. Paramagnetism. 14. Ferromagnetic ordering. Curie temperature. Magnons. Ferrimagnetic and antiferromagnetic ordering. 15. Point defects. Surfaces and interfaces.
Learning outcomes:	<p>Knowledge:</p> <p>W1: has elementary knowledge of the basic concepts and models used to describe the phenomena occurring in a solid, and also knows the practical applications of this knowledge</p> <p>W2: understands and can use mathematical formalism to describe solids and phenomena occurring in solids.</p> <p>Skills:</p> <p>U1: is able to analyze elementary problems in solid state physics and find their solutions based on the known theorems and methods of solid state physics</p>
Name of lecturer:	Paweł Szroeder
Email address:	psz@ukw.edu.pl