Level: bachelor

Course title: Fundamentals of condensed matter physics

Status: obligatory

ECTS: 7

Requirements: Electromagentism, Optics

Learning objectives

Acquisition of basic knowledge about models and methods in the field of condensed matter physics, and potential applications of crystals, liquid crystals and quasi crystals in modern technology and techniques.

Learning outcomes

After completing and mastering the course, students should possess:
- Analytical and scientific understanding of the physical processes in this area.
- Ability to use the relevant scientific literature.
- Understanding of the structure of ordered state, semi-ordered state, nanostructures and amorphous materials.
- Knowledge of methods of obtaining materials in a condensed state and their possible applications.
- Knowledge of the specificity of materials as a result of the dominant chemical bonding.
- Understanding of the basic physical properties of solid materials.
- Ability to transfer the acquired knowledge to other individuals and groups.

Syllabus

Theoretical instruction

Ordered state – crystals, partially disordered state – liquid crystals, quasi crystals, polymers and nanostructured materials. Disordered systems. Structure and properties.
The nature of chemical bonds. Bond energy and parameters of phase transformations.
Ordered systems. Principles of structural ordering. Ionic crystals. Metals. Covalent and molecular crystals. Crystals with hydrogen bonding. Complex crystals.

Processes and technologies of obtaining condensed state materials. Imperfections in crystals. Phase diagrams and methods of obtaining amorphous materials.

Condensed materials properties and methods of examination. Diffraction on crystal lattice. Behaviour of materials in mechanical field. Optical measurements. Condensed matter spectroscopy.

Practical instruction

Experimental and computational exercises follow the content of lectures.

Weekly teaching load				Other:
Lectures: 3	Exercises: 1	Other forms of teaching: 3	Student research:	