

Course title: **Materials science and technology**

Institute/Division: **Department of Chemistry and Technology of Polymers / FACULTY OF CHEMICAL ENGINEERING AND TECHNOLOGY**

Number of contact hours: **30 hours** (30 h lectures)

Course duration: 1 semester (5th semester of regular I cycle studies – fall/winter)

ETCS credits: **2**

Course description:

The course deals with the properties of crystalline and amorphous solids that are of relevance to modern and future technological advances. The following topics will be addressed: States of matter. Similarities and differences in crystalline and amorphous matter. Crystalline structures, unit cell, Bravais lattices. Diffraction from crystals, reciprocal lattice. Lattice vibrations and thermal properties. Electrons in a periodic potential, band structure, electron phonon-interaction, conductivity. Introduction to semiconductors. Thermoelectric phenomena, Peltier, Seebeck, and Thomson effects. Conductive polymers and polymeric semiconductors. Introduction to superconductors. Dielectric properties.

Education effects :

- knowledge: Understanding the fundamental phenomena underlying the thermal and electrical properties in the solid state, which are of relevance to modern and future technological advances.
- skills: Students will be able to predict qualitatively and quantitatively the physical properties of solids given their structure.
- social: Enhancing communication skills

Literature: [1] James Patterson, Bernard Bailey, Solid-State Physics - Introduction to the Theory, Springer-Verlag Berlin Heidelberg 2010

Assessment method: Final exam, exercise sets

Prerequisites: Entry level University courses in mechanics and electromagnetism. Entry level calculus. Entry level inorganic chemistry.

Primary target group: Advanced undergraduate students in the field of Chemical and Materials engineering

Lecturer: **dr Konstantinos Raftopoulos**

Contact person: raftopoulos@chemia.pk.edu.pl (KR)

Remarks: Regular course