Level: master

**Course title:** Thermal and thermomechanical properties of materials

Status: elective

#### **ECTS**: 9

### Requirements: none

# Learning objectives

Introducing students to the field of investigating of thermal and thermomechanical properties of materials.

# Learning outcomes

After completing the course, a student should have developed:

- knowledge of the characteristics of particular types of materials in condensed state;
- ability to monitor the scientific literature and prepare scientific publications;

- ability to perform independent measurements and experiments in order to characterize materials;

- ability to realize certain technical solutions.

### Syllabus

Theoretical instruction

Macroscopic and microscopic properties of materials. Crystalline and non-crystalline materials. Point defects as imperfections. Dislocations. Twinning crystals and stacking faults. Alloys. Phase diagrams of metals and alloys. Specific heat and influence of the structure. Thermal dilatation. Thermal conductivity. Lattice vibrations. Phonons. Mechanisms of heat conduction. Determination of thermal conductivity. Differential thermal analysis. Differential scanning calorimetry. Thermogravimetric analysis and derivative thermogravimetric analysis. Dilatometric analysis. The behaviour of materials under the influence of stress. Examination of material strength by pressure and bending. Examinations of fracture toughness. Static and dynamic methods for testing the hardness and microhardness.

### Practical instruction

Experimental exercises that follow the content of lectures, implementation and evaluation of oral presentations and seminars.

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