

<b>Level:</b> master		
<b>Course title:</b> Thermal and mechanical properties of materials		
<b>Status:</b> elective		
<b>ECTS:</b> 8		
<b>Requirements:</b> none		
<b>Learning objectives</b> Introducing students to the field of investigating of thermal and mechanical properties of materials.		
<b>Learning outcomes</b> After completing the course, a student should have developed: - ability to monitor the scientific literature and prepare scientific publications; -ability to realize certain technical solutions - ability to perform independent measurements and experiments in order to characterize materials; - knowledge of the characteristics of particular types of materials in condensed state and tendencies in their behavior under thermal and mechanical treatment		
<b>Syllabus</b> <i>Theoretical instruction</i> Macroscopic and microscopic properties of materials. Specific heat and influence of the structure. Thermal dilatation. Thermal conductivity. Mechanisms of heat conduction. Free electron Fermi gas. Heat capacity of the electron gas. Lattice vibrations. Phonons. Determination of coefficient of thermal conductivity. Differential thermal analysis. Differential scanning calorimetry. Thermogravimetric analysis and derivative thermogravimetric analysis. Simultaneous thermal analysis. Dilatometric analysis. The behaviour of materials under the influence of stress. Elastic and plastic deformation. Tensile properties. Shear and torsional deformation. Examination of material strength by pressure and bending. Examinations of fracture toughness. Static and dynamic methods for testing the hardness and microhardness. <i>Practical instruction</i> Experimental exercises and problem solving that follow the content of lectures, implementation and evaluation of oral presentations and seminars.		
<b>Recomanded literature</b> 1. W. D. Callister, Jr., <i>Materials Science and Engineering/An Introduction</i> , John Wiley and Sons, Inc. , USA, 2007. 2. P. Hofmann, <i>Solid state physics/An Introduction</i> , Wiley-VCH Verlag GmbH and Co. KGaA, Morlenbach, Germany, 2008. 3. M. P. Marder, <i>Condensed matter physics</i> , John Wiley & Sons,Inc.,USA, 2000. 4. P. Gabbott, <i>Principles and applications of thermal analysis</i> , Blackwell, Oxford, 2008. 5. W.W. M. Wendlandt, <i>Thermal Methods of Analysis</i> , John Wiley & Sons,Inc., New York & London,1974. 6. C. Kittel, <i>Introduction to solid state physics</i> , John Wiley & Sons, USA, 1971.		
	<b>Lectures: 3</b>	<b>Exercise and other forms of teaching: 2</b>