

Information sheet for the course Material Science I

University: <i>Alexander Dubček University of Trenčín</i>	
Faculty: <i>Faculty of Industrial Technologies in Púchov</i>	
Course unit code: <i>PP-P-4</i>	Course unit title: <i>Material Science I</i>
Type of course unit <i>optional</i>	
Planned types, learning activities and teaching methods: <i>Lecture: 2 hours weekly/26 hours per semester of study; face to face</i> <i>Seminar: 2 hours weekly/26 hours per semester of study; face to face</i> <i>Laboratory tutorial: 2 hours weekly/26 hours per semester of study; face to face</i>	
Number of credits: <i>6</i>	
Recommended semester: <i>1st semester in the 1st year full-time</i> <i>1st semester in the 1st year part-time</i>	
Degree of study: <i>the 1st degree of study (Bachelor's degree)</i>	
Course prerequisites: <i>none</i>	
Assessment methods: <i>Writing reports, continuous tests on lectured subjects, final examinations</i>	
Learning outcomes of the course unit: <i>Students gain basic knowledge on metallic materials, on their internal structure and defects, on crystallization of metals, binary equilibrium diagrams and the iron-carbon phase diagram. They are well versed in metallic materials – steels and cast irons and are able to apply this knowledge in theoretical materials engineering.</i>	
Course contents: Crystal structures of metals and alloys. Denotation of crystallographic planes and directions. Defects in crystals. Diffusion in metals and alloys. Diffusion mechanisms. Internal structure of metals and alloys. Basic thermodynamic laws in equilibrium systems. Crystallization of pure metals and alloys. Characteristic phases in metals and alloys. Solid solutions, mechanical mixtures and intermediate phases. Binary equilibrium diagrams. Binary equilibrium diagrams with complete solid miscibility. Lever rule. Binary equilibrium diagrams with complete solid and liquid immiscibility. Binary equilibrium diagrams with limited solid miscibility and peritectic reaction. Combined binary equilibrium diagrams with limited solid miscibility. Binary equilibrium diagrams with intermediate phases. Solid state phase transformations in metals and alloys. Polymorphism. Disintegration of solid solutions, precipitation and segregation. Pearlitic, bainitic and martensitic transformation. Peritectoid, eutectic, eutectoid reactions. Metastable Fe-Fe₃C systems. Cooling curves of alloys and formation of basic structures in dependance on the content of carbon. Description of basic phases and their effect on material properties. Stable iron-graphite system. Graphite cast irons. White irons. Cast irons with flake, nodular and vermicular graphite. Alloyed cast irons. Heat treated graphite cast irons.	

Revision and answers to questions from students on the lectured subjects.

Recommended references and resources:

1. Pulc, V., Hrnčiar, V., Gondár, E.: *Náuka o materiáli*, STU Bratislava, 2004, rok vyd. 2004, ISBN 80-227-2098-4.
2. Michel, J., Benkom, B., Šebo, P.: *Náuka o materiáli*, STU Bratislava, Vazovova 5, rok vyd. 2004, ISBN 80-227-2098-4.
3. Skočovský, P., Bokůvka, O., Konečná, R., Tillová, E.: *Náuka o materiáli pre odbory strojnícke*. Vydala Žilinská univerzita EDIS – vydavateľstvo ŽU, 2001, ISBN 80-7100-831-1.
4. Ptáček, L. a kol.: *Nauka o materiálu I*, Akademické nakladatelství CERM, Brno, 2002, ISBN 80-7204-283-1.
5. Ptáček, L. a kol.: *Nauka o materiálu II*, Akademické nakladatelství CERM, Brno, 2003, ISBN 80-7204-248-3.

Language: Slovak

Remarks: none

Evaluation history: Total number of classified students : 8

A	B	C	D	E	FX
37.5	12.5	50.0	0.0	0.0	0.0

Lecturers: prof. Ing. Františka Pešlová, PhD., Ing. Ľuba Hajduchová, PhD.

Last modification: 31.03.2015

Supervisor: doc. Ing. Ján Vavro, PhD.