

Assessment and subject description

Óbuda University Kandó Kálmán Faculty of Electrical Engineering		Institute of Microelectronics and Technology		
Subject name and code: Materials science for engineers, KEXVR1ABNE				Credits: 3
Full-time, Fall Semester				
Course: Electrical Engineering				
Responsible:	Csikósné Dr Pap Andrea, PhD.	Teaching staff:	Balázs Kovács, PhD	
Prerequisites:	no			
Contact hours per week:	Lecture: 2	Class discussion: 0	Lab hours: 0	Tutorial: 0
Assessment and evaluation:	Exam			
Subject description				
<i>Aims:</i> Introduction to and basic knowledge of materials science. Relations among preparation methods, structure and properties of materials.				
<i>Topics to be covered:</i> Topics are detailed below. The lecturer could deviate from the listed topics by 25%.				
Topics			Week	Lessons
Introduction to materials science. Relations between composition, structure, processing and properties of materials.			1	2
Structure of atoms. Bohr model and wave mechanics' models. The periodic table. Characteristic parameters. Atomic bonding. Relation between bonding and material behavior.			2	2
Crystal structure. Types of crystals, lattice parameters. Packing factors, densities. Real crystals. Types of defects, lattice vibrations.			3	2
Methods of investigation of crystal structure. Optical and electron microscopy. Atomic force and scanning tunneling microscopy. X-ray and electron diffraction.			4	2
Transport in materials. Equilibrium vs. non-equilibrium. Electrical and heat transport. Material transport: steady-state and non-steady-state diffusion. Oxidation.			5	2
Test 1			6	2
National Holiday			7	2
Alloys. Phase transitions and phase diagrams.			8	2
Mechanical properties of materials. Deformation, stress and strain. Ductility, toughness, hardness. Mechanical failures.			9	2
Electrical properties of materials. Band theory. Metals, semiconductors, insulators.			10	2

Magnetic properties of materials. Types of magnetism. Ferro- and ferrimagnetism. Magnetic storage of information.	11	2
Optical properties of materials. Light interaction with solids. Absorption, reflection, transmission, refraction, polarization and their relation to electron structure. Light emission.	12	2
Test 2	13	2
New results in Material Sciences	14	2
<p>Assessment and evaluation</p> <p>Requirements of the signature:</p> <ul style="list-style-type: none"> • To attend the lectures is obligatory. Max 30% of the lecture could be passed. • To pass both tests – the student should overcome 50% of obtainable points of each test. • To do the repeat test for free one occasion for each test will be provided. <p>Type of exam:</p> <ul style="list-style-type: none"> • Written, covering the all topics of the course. To pass the exam at least 50% of the obtainable points should be reached. 		
<p>Suggested material</p> <p>Fundamentals of Materials Science and Engineering William D. Callister, Jr.; David G. Rethwisch; 910 pages; John Wiley & Sons; 4 Edition (2013); ISBN: 978-1-118-32269-7</p> <p>Semiconductor Devices: Physics and Technology Simon M. Sze, Ming-Kwei Lee; 592 pages; John Wiley & Sons; 3 Edition (2012); ISBN-10: 0470537949; ISBN-13: 978-0470537947</p>		
<p>Comment:</p> <p>The lecture's materials are the basics of the learning process. They could be found on the concerned web sites of the university (Moodle system) and on the lecturer's web page http://www.uni-obuda.hu/users/kovacs.balazs/.</p>		