

## Assessment and subject description

<b>Óbuda University</b> Kandó Kálmán Faculty of Electrical Engineering		Institute of Microelectronics and Technology		
Subject name and code: Materials Science KMEVR11AND, KMEVR11ANC <b>Credits: 3</b> <b>Full-time, Autumn Semester</b>				
Course: Electrical Engineering				
Responsible:	Balázs Kovács, PhD.	Teaching staff:	<b>Balázs Kovács, PhD</b>	
Prerequisites:				
Contact hours per week:	Lecture: 2	Class discussion:	Lab hours:	Tutorial:
Assessment and evaluation:	<b>Exam</b>			
<b>Subject description</b>				
<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>				
<b>Topics</b>			<b>Week</b>	<b>Lessons</b>
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
Alloys. Phase transitions and phase diagrams.			5	2
Transport in materials. Equilibrium vs. non-equilibrium. Electrical and heat transport. Material transport: steady-state and non-steady-state diffusion. Oxidation.			6	2
<b>National Holiday</b>			7	
Mechanical properties of materials. Deformation, stress and strain. Ductility, toughness, hardness. Mechanical failures.			8	2
Electrical properties of materials. Band theory. Metals, semiconductors, insulators.			9	2
Magnetic properties of materials. Types of magnetism. Ferro- and ferrimagnetism. Magnetic storage of information.			10	2
<b>University Break</b>			11	

Optical properties of materials. Light interaction with solids. Absorption, reflection, transmission, refraction, polarization and their relation to electron structure. Light emission.	12	2
Properties of metals and ceramics.	13	2
Properties of polymers and composite materials.	14	2
<b>Assessment and evaluation</b>		
<p>Requirements of the signature: To attend the lectures is obligatory. Above that, it is required to pass two tests - to be performed at a separate occasions in the 5th and 10th week -.</p> <p>Type of exam: Written and verbal</p>		
<b>Suggested material</b>		
<p><b>Fundamentals of Materials Science and Engineering</b> William D. Callister, Jr.; David G. Rethwisch; 910 pages; John Wiley &amp; Sons; 4 edition (2013); ISBN: 978-1-118-32269-7</p> <p><b>Semiconductor Devices: Physics and Technology</b> Simon M. Sze, Ming-Kwei Lee; 592 pages; John Wiley &amp; Sons; 3 edition (2012); ISBN-10: 0470537949; ISBN-13: 978-0470537947</p>		
<p>Comment: The lecture's materials are the basics of the learning process. They could be found on the concerned web sites of the university.</p>		