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, KEEVR5ABNE Credits: 3** **Full-time**				
Course: Electrical Engineering				
Responsible:	Csikóné Dr. Pap Andrea, PhD.	Teaching staff:	**László Balázs, PhD.**	
Prerequisites:	none			
Contact hours per week:	Lecture: 2	Class discussion: 0	Lab hours: 0	Tutorial: 0
Assessment and evaluation:	**exam**			

Subject description

Learning objectives: Introduction to and basic knowledge of materials science. Relations among preparation methods, structure and properties of materials.

Topics to be covered:

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**
Alloys. Phase transitions and phase diagrams.	**7.**	**2**
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**
Optical properties of materials. Light interaction with solids. Absorption, reflection, transmission, refraction, polarization and their relation to electron structure. Light emission.	**11.**	**2**
New results in Material Sciences	**12.**	**2**
Test 2	**13.**	**2**
Course closure / retake tests	**14.**	**2**

Assessment and evaluation

Requirements of the signature: Regular class attendance is a prerequisite for receiving credit in the course. Course attendance is tracked and maximum 2 absences are allowed. Students whose absences exceed 2 will be dropped from the course. Laboratory mark should exceed 2.

Students will take two tests during the course. The minimum requirement to pass each test is to achieve 50% of total scores. Students can retake the test for free in case they do not reach the minimum requirements. Final correction opportunity is within the first 10 days of the examination period. (Aláíráspótló vizsga)

Type of exam: Written, covering the all topics of the course.

Evaluation of the mark: Mark is determined by the table below:

Mark	Total score
5	85-100 %
4	74-84 %
3	63-73 %
2	50-62 %
1	0-49 %

Suggested material

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
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

Comment: Learning materials will be uploaded in the Moodle.