



<b>1. Subject name</b>	<b>Materials Science</b>				
<b>2. Subject name in Hungarian</b>	Anyagtudomány				
<b>3. Code</b>	<b>BMEKOGGD001</b>	<b>4. Evaluation type</b>	<b>exam grade</b>	<b>5. Credits</b>	<b>4</b>
<b>6. Weekly contact hours</b>	<b>4 (0) Lecture</b>	<b>0 (0) Practice</b>	<b>0 (0) Lab</b>		
<b>7. Curriculum</b>	<b>PhD Programme</b>	<b>8. Role</b>	<b>Basic course</b>		
<b>9. Working hours for fulfilling the requirements of the subject</b>					<b>84</b>
<b>Contact hours</b>	56	<b>Preparation for seminars</b>	0	<b>Homework</b>	8
<b>Reading written materials</b>	8	<b>Midterm preparation</b>	0	<b>Exam preparation</b>	12
<b>10. Department</b>	<b>Department of Automotive Technologies</b>				
<b>11. Responsible lecturer</b>	Dr. Bán Krisztián				
<b>12. Lecturers</b>	Dr. Bán Krisztián				
<b>13. Prerequisites</b>	<b>recommended: BMEKOGGM601 - Advanced materials and technologies</b>				
<b>14. Description of lectures</b>					
<p>Material structures: bonding types, materials with crystalline and amorphous structure.            Thermodynamics, diffusion, phase transitions.            Non-equilibrium systems and thermodynamics: amorphous and nanostructured materials and their properties. The role of surface in material properties.            Material properties: effect of different bonding types, defect structure (real structure) on transport, optical, magnetic and mechanical properties.            Material testing: procedures for polycrystalline materials: X-ray diffraction, texture test. SEM, DSC, TEM as test methods. Metallographic examinations, microscopic properties of structural materials, examination of grain structure. Spectroscopy. Mechanical (tensile, micro- and macro-hardness, impact energy) test methods and equipments, non-destructive testing methods for material defects. Special material testing methods.</p>					
<b>15. Description of practices</b>					
<b>16. Description of laboratory practices</b>					
<b>17. Learning outcomes</b>					

### A. Knowledge

- Recognizes new regularities in the types of chemical bonds.
- It recognizes new laws of crystalline and amorphous structure.
- It recognizes new regularities in the field of thermodynamics.
- It recognizes new laws of diffusion.
- It recognizes new regularities about the thermodynamic background, types, energetic relations of phase transitions, and the importance of the interface in phase transitions.
- Recognizes new regularities about types of non-equilibrium systems.
- It recognizes new regularities about the role of the interface in material properties.
- Recognizes new regularities in the properties of amorphous and nanostructured materials.
- Recognizes new regularities about the effects of different bonds, error structures (real structures) in transport, optical, magnetic and mechanical properties.
- Recognizes new regularities with major direct structural analysis methods: XRD, texture, SEM, TEM, optical microscopy.
- It recognizes new regularities in major spectroscopic examination procedures.
- Recognizes new laws regarding the DSC test method.
- Recognizes new laws through the application of major mechanical and non-destructive material testing methods.

### B. Skills

- It is capable of understanding the entire process and its elements, or of a process. plan.
- It is capable of deeper, causal, scientific analysis of a technological or measurement process.

- Can formulate suggestions for the development of a technological or measurement process.
- He / she is able to collect literature on a specific research topic for a focus question and to compile a summary based on it.
- They are able to interpret the results found in the literature.
- He / she is able to design experimental designs and research methods on a research topic.
- Able to interpret test results.

#### C. Attitudes

- It strives to develop its knowledge independently.
- It strives to ensure that each topic area and / or theme. look for relationships between disciplines.
- It seeks to ensure that the literature and literature. interpret your own research results individually and in teamwork, listening to the thoughts of others.
- It seeks to share its knowledge.

#### D. Autonomy and Responsibility

- Responsibly apply the knowledge gained in the subject subject to its limitations.
- It manages according to ethical standards and communicates the results to others and itself.
- It seeks to carry out the task entrusted to it independently, in accordance with ethical standards.
- You are aware of the extent to which your responsibilities extend to informing your colleagues or supervisors of the results and if needed.

---

### 18. Requirements, way to determine a grade (obtain a signature)

---

The course ends with an oral examination.

---

### 19. Opportunity for repeat/retake and delayed completion

---

Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

---

### 20. Learning materials

---

1. Charles Kittel: Introduction to solid state physics,
  2. Thornton, Calangelo: Fundamentals of engineering materials, Prentice-Hall, Inc. New Jersey, 1985,
  3. Flinn, Trojan: Engineering Materials and Their Applications,
  4. Kalpakijan S.: Manufacturing Engineering and Technology, Prentice Hall, 2013.
  5. Auxiliary materials and ppt's downloadable from the department website.
- 

<b>Effective date</b>	27 November 2019	<b>This Subject Datasheet is valid for</b>	Inactive courses
-----------------------	------------------	--	------------------

---