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| Óbuda UniversityBánkiDonátMechanical Safety Engineering Faculty | **Institute of Materials and Manufacturing Sciences**Department of Materials Technology |
| *Name of the subject:*Engineering Materials | *NEPTUN-code:* ***credits:***BAXMNE2BNF,  |
| *Subject leader:*Dr. habil. Tünde Kovács PhD associate professor*Practice:* PéterVarga PhD assistant professor | Semester: 2023/2024. 1.  |
| ***Course description:*** |
| Fundamentals of materials testing, mechanical, physical metallurgical and non-destructive testing methods. Atomic and higher structures of metals, polymers, ceramics and composites. Solidification and crystalline structure of metals. Interpretation of the equilibrium diagram and its information content. Iron-carbon alloys. The process of cold forming and recrystallisation and the consequences in practice. Structure, types and processing of polymers. Structure and properties of ceramics and composite materials. |
| Lessons per Week: | Lectures: 2 | Labs: 0 | Practice: 1 | Consultation by request |
| Evaluation: | exam |

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| **1. Lecture program** |
| **Date** | **Subject** |
| 1 | A general overview of engineering materials.Tensile test,Brinell, and Vickers hardness tests,impact test. |
| 2 | Crystal structure of metals. Ideal crystals. |
| 3 | Crystal structure of metals. Real crystals, imperfections in crystals. |
| 4 | The crystallisation of metals and alloys. The structure of alloys. |
| 5 | Deformation, strain hardening, recrystallization |
| 6 | Phase diagrams. |
| 7 | Iron-carbon phase diagram. Metastable system. |
| 8 | Steels. International steel designation system. |
| 9 | Iron-carbon phase diagram. Stable system. Cast irons. Types of cast irons. |
| 10 | Non-equilibrium transformation of steels |
| 11 | Nonferrous metals and alloys |
| 12 | Structure, types and processing of polymers. Reinforced plastics. Synthesis of the semester study. |
| 13 | **Test** |
| 14 | **Repeated test** |

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| **2. References****J. Verebély-Dévényi, P. Rácz**: Engineeringmaterials, Óbuda University, 2012.**R. E. Smallman, R. J. Bishop**: Modern Physical Metallurgy and Materials Engineering,Butterworth-Heinemann**P. Rácz**: Lecture presentation slides; www.elearning.uni-obuda.hu |

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| **3. Requirements** |
| 1. **Taking part in lessons:**

Taking part in practical lessons is obligatory, visiting lectures is recommended. |
| 1. **Tests and other tasks**
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| **Date** | **Tests** |
| 13 | Test  |
| 14 | Repeater tests |
| 1. **Terms of signature and practice mark**

Students who accomplish semester requirements get signature and practice mark. |
| 1. **Evaluation of practice mark**

Follow the Moodle instructions also about the practice!Midterm mark is the mean value of the test (or repeater test) results and the result of the exercises (see practical lessons), if none of those unsatisfactory (1). If any of these results remains unsatisfactory by the end of the semester the midterm mark is also unsatisfactory (1).The result of the exercises (practical lessons) is the mean value of all three exercises, if none of those are unsatisfactory (1). Othervise this result is unsatisfactory (1).  |
| 1. **Repeater tests**

A failed test can be rewritten on last week of the lesson period of the semester. |
| 1. **Repeater test in examination period of the semester**

Failed midterm mark can be improved in the first two weeks (10 working days) of the examination period. The date of it is given by the reader before the end of the lesson period. |

Budapest, 12.06.2023.

 **Dr Tünde Kovács**

 **Lecture, associate professor**

**Instructions for practical lessons**

**Schedule**

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| **Academic week** | **Topic** | **Room** |
| 1 | Introduction of academic requirements | F16 |
| 2 | Hardness tests | P22A |
| 3 | Tensile test(assignment) | U9 |
| 4 | Charpy Impact test(Tensile test assignment hand in) | P22A |
| 5 | Recrystallization of metals | F16 |
| 6 | Microscopy | F16 |
| 7 | Phase transformations in metals(assignment) | F16 |
| 8 | Phase diagrams(Phase transformation assignment hand in) | F16 |
| 9 | The iron-carbon phase diagram, steels(assignment) | F16 |
| 10 | The iron-carbon phase diagram, cast irons(Iron-carbon phase diagram assignment hand in) | F16 |
| 11 | Non-equilibrium transformation of steels | F16 |
| 12 | No class | - |
| 13 | Heat treatment of steels | P22A |
| 14 | Consultation | F16 |