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| The title of the course | **Materials Science: Materials Engineering** |
| Faculty | [Faculty of Mechanical Engineering and Computer Science](http://eng.ath.bielsko.pl/index.php/faculties/gerg) |
| The level of studies | Undergraduate (BA) |
| Semester | Winter/summer |
| The form of classes and number of hours | Lecture/ Project |
| Language of instruction | English |
| The number of ECTS | **2 ECTS** |
| Teacher | dr hab inż. Dariusz Jędrzejczyk, prof. UBB |
| The aims of the course | The course aim is to introduce students to engineering materials world and specific materials properties (mechanical and physic-chemical). It regards: metals, polymers, ceramics and composites. Topics refer to correlation of these properties with their internal structures (atomic, crystalline, micro- and macro-), application conditions (mechanical, thermal, chemical, etc.) and processing. Course will also cover phase transformations and phase equilibria and how they impact microstructure development. This course describes the most recent advances in the synthesis, fabrication and characterization of polymers and nanomaterials. |
| The content of the course: main topics and key ideas | 1. Introduction to engineering materials, short description of materials properties and application, characterization of the criteria of division -1h 2. Atomic structure, atomic bonding, crystal structures, defects, and diffusion in materials -1h 3. Phase transformations and phase equilibria and their impact on microstructure -2h 4. The impact of alloy composition on the micro-structure; property differences and design philosophy in steels, cast iron, titanium and aluminum alloys, focusing on construction, aerospace and automotive industry-4h 5. Modern fabrication technologies and applications of metals, ceramics, composites and polymers -2h. |
| Didactics methods | Multimedia presentation, discussion |
| Course requirements | Exam/attendance |
| Literature (basic and supplementary) | Basic   1. Ashby M.F., Shercliff, Cebon D., Materials: engineering, science, processing and design, Butterworth-Heinemann, 2013 2. Ashby M.F., Materials Selection in Mechanical Design, Butterworth-Heinemann, 2004 3. Callister D.W., Rethwisch D.G., Materials Science and Engineering: An introduction, 8th ed. Wiley, 2013 4. Cardarelli F., Materials Handbook, Springer, 2nd ed., 2008 5. Berns H., Scheibelein G., Theisen W., Ferrous Materials, Springer-Verlag Berlin Heidelberg 2008   Supplementary   1. Davis J.R., Aluminum and Aluminum Alloys, ASM International, 1993 2. Cantor B., Assender H., Grant P., Aerospace Materials, IOP Publishing Ltd, 2001 3. Davis J.R., Concise Metals Engineering Data Book, ASM International, 2010 4. Callister D.W., Rethwisch D.G., Materials Science and Engineering: An integrated approach, d. Wiley, 2012 5. Weng Y., Dong H., Gan Y., Advanced Steels, Springer and Metallurgical Industry Press, 2011 6. Chawla K. K., Composite materials, Science and Engineering, Springer, 2011 7. Carter C.B., Norton M. G., Ceramic materials, 2nd ed. Springer, 2013 |
| The effects of the education   * knowledge * skills * social competences | (K) Knows the differences between engineering materials is able to select to proper material to specific application  (Sk) Is able to select the proper material to specific application  (So) Be aware of responsibility for own work and is ready to comply with rules of cooperation in team |