

**Lecture: Introduction to materials science
Year 1.
prof. Boguslaw MAJOR**

The course covers the following topics:

- 1. Engineering materials**
- 2. Atomic bonding and crystallography**
- 3. Mechanical properties**
- 4. Crystal defects of crystalline structure**
- 5. Phase diagrams**
- 6. Structure changes**
- 7. Metals and alloys**
- 8. Ceramic materials and glasses**
- 9. Polymers**
- 10. Composites**
- 11. Intermetallics**
- 12. Amorphous and nanocrystalline materials**
- 13. Porous materials**
- 14. Smart materials**
- 15. Biomaterials**
- 16. Processing of metals, ceramics, polymers, composites**
- 17. Surface engineering**
- 18. Nanomaterials and nanotechnologies**
- 19. Basis for materials design**

The lecture includes an introduction to materials science and engineering focused on science-led approach however it gives little emphasis to design-led. Guiding learning on materials and their structure and properties, crystallography, phase diagrams and phase transformations, processing, diagnostics and application is given. Some information are presented on fundamentals and understanding, control of properties at a different scale as well as materials selection and design. The lecture is divided into parts comprising: a basing knowledge, possible application and diagnostics together with examples of chosen experimental results. The lecture is dedicated to students motivating their understanding of the nature of modern material design and developing skills.

The course is based on:

- M.Ashby: Materials; engineering, science, processing and design, Elsevier 2010
- R.Pampuch: ABC of Contemporary Ceramic Materials, Techna Group, 2008
- M.Blicharski: Wstęp do inżynierii materiałowej, Wyd. Nauk.-Techn. 2003
- L.A.Dobrzański: Metalowe materiały inżynierskie, Wyd. Nauk.-Techn., 2004
- Mazurkiewicz: Nanonauki i Nanotechnologie, Wyd.Inst.Technol.Ekspl., Radom 2007