|  |  |
| --- | --- |
| The title of the course | **Materials Science: Engineering of Biomaterials** |
| Faculty | [Faculty of Mechanical Engineering and Computer Science](http://eng.ath.bielsko.pl/index.php/faculties/gerg) |
| The level of studies | Undergraduate (BA)  Postgraduate (MA)  Engineer (BSc) |
| Semester | Winter/summer |
| The form of classes and number of hours | Laboratory/Project |
| Language of instruction | English |
| The number of ECTS | 2 |
| Teacher | Dr hab. inż. Izabella Rajzer, prof. UBB |
| The aims of the course  (maximum 500 characters) | This course focuses on the selection, processing, testing and performance of materials used in biomedical applications. Biomaterials are an integral part of medical devices, implants, controlled drug delivery systems, and tissue engineered constructs. |
| The content of the course: main topics and key ideas | **1. Introduction to Biomaterials (2h).**  Definitions of biocompatibility.  **2. Bioceramic materials (2h)**  A general overview of bioinert, bioactive or surface reactive ceramics, and biodegradable or reabsorbable bioceramics.  **3. Metals in biomedical applications (2h)**  Biocompatibility of metals, Failure of metals for biomedical devices, Recent developments in metals for biomedical devices.  **4. Polymeric materials and composites (2h)**  Basic chemical and physical properties of the synthetic and natural polymers; sterilization methods; surface treatment for improving biocompatibility; design, fabrication, and application of polymeric biomaterials and composites.  **5. Technologies of biomaterials processing (1h)**  Recent advances in the development of biomaterials. Scaffolds for Tissue Engineering .  **6. Methods of biomaterials testing (1h).**  *In vito* and *in vivo* methods. |
| Didactics methods | Presentations and discussions of the current literature in an area of biomaterials engineering. |
| Course requirements | Presentation made by student |
| Literature (basic and supplementary) | 1) Park JB, Bronzino JD. Biomaterials: Principles and Applications. CRC Press, 2002.  2) Chu PK, Liu X. Biomaterials Fabrication and Processing. HANDBOOK. CRC Press, 2008.  3) Buddy D. Ratner et al. BIOMATERIALS SCIENCE: An Introduction to Materials in Medicine. 2nd Edition. Elsevier Academic Press, 2004.  4) Ikada Y. Tissue Engineering, Fundamentals and Applications. Elsevier Academic Press, 2006.  **5) Recent publications in Biomaterials.** |
| The effects of the education   * Knowledge * Skills * Social Competences | Having successfully completed the course, the student will:  -Understand the principles of biomaterials design and development,  -Have a basic knowledge of four types of biomaterials; metallic, polymeric, ceramic and composite and their use in typical medical devices,  - Understand some of the material selection requirements for biomaterials,  - Be familiar with various evaluation techniques.  - Have a basic skills needed to design and characterize new biomaterials.  - Have practical experience in the search, retrieval, and analysis of scientific papers/literature.  - Have practical experience in presentation of scientific information. |