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| The title of the course | **Design Theory** |
| Faculty | [Faculty of Mechanical Engineering and Computer Science](http://eng.ath.bielsko.pl/index.php/faculties/gerg) |
| The level of studies | MSc Engineer (MSc); second level |
| Semester | Winter/summer |
| Classes conducted for Polish students. Erasmus students can join them | Yes |
| The form of classes and number of hours | Lecture/Project (Regular Lectures or Tutorial system) |
| Language of instruction | English |
| The number of ECTS | 2 |
| Teacher | Dr inż. Jerzy Kopeć |
| The aims of the course | The course covers chosen topics connected with design theory. The aim is to prepare a student to participate in advance product development or/and research within mechanical design tasks. Student should be able perform analysis and taken reasonable engineering decisions. To give a student an overview about design procedures in general as well as different aspects of design procedures, modern techniques and standard approaches. |
| The content of the course: main topics and key ideas | Review of methods of design. Reliability design. The course/flow of design process with an emphasy on so called closed loops (connected with changing/ /repeating of some steps of the design routine). The idea of innovative design – review of methods for searching for new ideas. Several general approaches to design as: optimization, standardization and serialization.  Review of the method of searching for new ideas; some case studies. Bionics – biological insight into mechanical design.  Methods of modelling and simulation of mechanical systems.  Application of artificial intelligence methods in mechanical design (expert systems, case-based-reasoning etc.).  Conceptual design – graph-based methods for creation of atlases of design solutions. |
| Didactics methods | Lectures, discussions, self studying |
| Course requirements | Presentation/attendance/preparation of written report |

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| Literature (basic and supplementary) | 1] Birmingham R., Cleland G.: Understanding Engineering design. Context, Theory and Practice, Prentice Hall, London, 1977.  2] French M.: Conceptual design for engineers, Springer Verlag, London, 1999.  3] Suh: The principles of design, Oxford University Press, New York, 1990.  4] Ullman D.: The mechanical design process. Understanding machine design, New York, McGraw-Hill, 1992.  5] Glegg G.L.: the science of design, Cambridge, UP, 1973.  U1] Pahl G., Beitz W., Feldhusen J., Grote K.-H.: Engineering Design. A systematic approach. Springer 2007.  U2] Foster T.R.V.: 101 Ways to Generate Great Ideas, Kogan Page Ltd., U.K., 1991.  U3] Waldron M.B., Waldron K.J.: Mechanical Design – Theory and Methodology, Springer Verlag, 1996.  U4] Spignesi S.J.: American Firsts. Innovations, discoveries and gadgets born in USA, Career Press, 2004.  U5] Kusiak A.: Intelligent system in design and manufacturing, ASME Press, New York, 1994. |
| The effects of the education   * knowledge * skills * social competences | Knowledge:  She/he knows general principles of engineering design.  Student knows general strategies connected with design: optimization, reliability, modelling, simulation, standardization and serialisation.  Skills:  Student is able to carry out simulation, standardisation (e.g. taking into account ‘normal numbers’).  Can use basic techniques for searching for new ideas.  Social competences (depending on number of students):  She/he can share a design task.  Student recognizes a need of self-education, can share task of browsing through net, checking the references, catalogues and user guides. |