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| The title of the course | **Analytical Mechanics** |
| Faculty | [Faculty of Mechanical Engineering and Computer Science](http://eng.ath.bielsko.pl/index.php/faculties/gerg) |
| The level of studies | Postgraduate (MA) |
| Semester | Winter/summer |
| The form of classes and number of hours | Lecture |
| Classes conducted for Polish students. Erasmus students can join them | Yes |
| Language of instruction | English |
| The number of ECTS | 1 |
| Teacher | dr hab. inż. Andrzej Harlecki, prof. UBB |
| The aims of the course | The aim of the course is to give the students the foundations of analytical mechanics based on calculus of variations. The general aim of this course is to advance the student's knowledge of classical mechanics. Lectures include informations about the main methods of analytical mechanics. These methods of large practical significance are based on the different mathematical formalisms. It’s important because the same problem can be solved using different methods. Thus, students using the methods can also verify correctness of calculation results. The course gives the good introduction to the analysis of dynamics of multibody systems. This analysis can be used in the process of virtual prototyping in machine designing. |
| The content of the course: main topics and key ideas | 1.Classification of constraints. Generalized coordinates, velocities and accelerations. Generalized forces  2. Virtual displacement. Principle of virtual works  3. Hamilton’s principle  4. D’Alembert’s principle. Gauss’s principle of least constraint and Hertz principle of least curvature  5. Hamilton-Jacobi equation  6. Lagrange’s of the second kind equations of motion  7. Maggie’s equations of motion  8. Appell’s equations of motion  9. Boltzamann-Hamel equations of motion |
| Didactics methods | Lectures by using multimedia equipment |
| Course requirements | Exam |
| Literature (basic and supplementary) | Basic  1. Fowles G.R., Cassiday G.L., Analytical  Mechanics, Thomson Brook Cole, 2005  2. Goldstein H., Poole C.P., Safko J.L., Classical  Mechanics, Pearson Education, 2002  3. Taylor J.R., Classical Mechanics, University  Science Books, 2006  Supplementary  1. Greenwood D.T., Principles of Dynamics,  Prentice-Hall of India, 1988  2. Skalmierski B., Mechanics and Strength of  Materials, Polish Scientific Publishers, 1979 |
| The effects of the education   * knowledge * skills * social competences | - knowledge  He knows basic principles of the analytical mechanics and the rules of their correct application in the practise  - skills  He is able to solve selected problems of analytical mechanics which reflect real engineering tasks  - social events  He is able to think independently trying to solve creatively different technical problems using suitable formalisms of analytical mechanics |