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| The title of the course :  **Operation research and optimisation** | **E-FMECS>08-ORO** |
| Faculty | [Faculty of Mechanical Engineering and Computer Science](http://eng.ath.bielsko.pl/index.php/faculties/gerg) |
| The level of studies | Engineer (BSc) |
| Semester | Winter |
| The form of classes and number of hours | Lecture/Project  15h/15h |
| Language of instruction | English |
| The number of ECTS | 2 |
| Teacher | Dr inż. Jerzy Marszałek |
| The aims of the course  (maximum 500 characters) | Acquainting students with formulating, theory and algorithm of solving of linear programming problems in continuous sets. Formulating, theory and solving of nonlinear programming unconstrained and constrained problems – necessary and sufficient conditions of existing of a solution. Discussing of theoretical fundamentals of numerical algorithms of solving nonlinear programming problems including constrained and unconstrained problems. |
| The content of the course: main topics and key ideas | 1. Introduction to optimisation, 2. Linear programming – revised simplex algorithm, 3. Nonlinear programming – analytical optimisation,    1. necessary and sufficient conditions of existing of a solution in unconstrained problems,    2. necessary and sufficient conditions of existing of a solution in constrained problems, 4. Nonlinear programming – numerical algorithms,    1. One-dimensional minimization algorithms,    2. Multi-dimensional unconstrained problem,    3. Multi-dimensional constrained problem, |
| Didactics methods | Regular lectures with multimedia presentation, 1 hour per week, didactic materials in printing available in English,  2 or 3 homework exercises |
| Course requirements | Exam in writing (solving of practical problems + answer to theoretical questions) |
| Literature (basic and supplementary) | 1. Stadnicki J. : “Teoria i praktyka rozwiązywania zadań optymalizacji”, WNT, Warszawa 2006, 2. Singiresu S. Rao: „Engineering optimization”, John Wiley & Sons, Inc., 1966, 3. Mokhtar S. Bazaraa, Hanif D. Sherali, C.M. Shetty: “Nonlinear programming. Theory and algorithms”, John Wiley & Sons 2006, |
| The effects of the education   * knowledge | * Student has knowledge about types of optimisation problems and methods how to solve them, * Student knows algorithms of solving of: linear programming problems, * Student knows necessary and sufficient conditions of existing of nonlinear programming problems solutions, * Student knows numerical algorithms of solving of unconstrained and constrained nonlinear programming problems, |
| * skills | * Student can select proper algorithm of solving of a specified type of optimisation problem, * One can solve optimisation problem numerically using a proper algorithm, * Student is able to use analytical methods to solve practical optimisation problems. |
| * social competences | * Student has consciousness of necessity of methodical approach in formulating and solving of optimisation problems. * Student has consciousness of necessity of applying numerical methods in solving of practical technical problems. |