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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/Project15h/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,
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| 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,
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| 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,
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| * 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.
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| * 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.
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