STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Computational methods in optimization**		Code **1010342531010341697**
Field of study **Mathematics**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **-**	Subject offered in: **polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	

No. of hours					No. of credits
Lecture: **1**	Classes: **-**	Laboratory: **1**	Project/seminars: **-**		**4**

Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**

Education areas and fields of science and art **the sciences**	ECTS distribution (number and %**)** **4 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Calculus (functions of several variables), linear algebra, numerical linear algebra, nonlinear optimization theory (Lagrange multipliers, the K-K-T conditions).
2	**Skills**	Knowledge of the high level programming languages.
3	**Social competencies**	The ability to build mathematical models for practical problems.

Assumptions and objectives of the course:

To familiar students with modern numerical techniques used to solve practical engineering , optimization   (differentiable and non-differentiable) problems and analysis of their efficiency.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. 1 To create a mathematical model for a typical, practical optimization problem. - [K_W10]

2. 2 To choose an appropriate, effective and realiable numerical algorithm for solving optimization problem. - [K_W11]

3. 3. Practical use of the advanced techniques of numerical linear algebra in solving problems of various applications and branches of mathematics - [K_W10]

4. To prepare the adequate computer program, interpret the results. - [K_W11]

Skills:

1. The ability to build the models and to solve practical optimization problems - [K_U11]

Social competencies:

1. 1The ability of cooperation in a team. - [K_K03]

Assessment methods of study outcomes

Homeworks   30%.
Projects   30% ,
Final quiz 40%.

Course description

1. Common problems of optimization and why do we need to use numerical methods to solve them.

2. Linear programming. Simplex method versus Interior point method.

3. Non-linear optimization without constraints. Non-linear least-squares problem

4. Non-linear optimization with constraints of different types.

5. Information on global optimization algorithms

6. Network flows optimization.

7. Optimization methods in training neural networks.

Basic bibliography:

1. 1. Stachurski, Wierzbicki,   Foundations of optimization, Publishing House of the Warsaw University of Technology, Warsaw, 2001. (in Polish)

2. J. Nocedal Wright S.J. Numerical Optimization 2nd ed., Springer, New York, 2006.

Additional bibliography:

1. Vankataraman P. Applied Optimization with MATLAB Programming, Wiley, New York

2. Optimization Toolbox for Use with MATLAB, The MathWorks Inc., Natick, 2012.

Result of average student's workload	
Activity	**Time (working hours)**
1. 150	150
Student's workload	

Source of workload	**hours**	**ECTS**
Total workload	110	4
Contact hours	30	4
Practical activities	30	0