STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Optimization Methods		**1010802121010842883**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electronics and Telecommunications	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Information and Communication	**English**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **1**	Classes: **-**	Laboratory: **1**	Project/seminars: **-**		**2**

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

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	1. Has a systematic knowledge of mathematical analysis, algebra and theory of probability (K1_W01)
2	**Skills**	1. Is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions (K1_U01)
3	**Social competencies**	1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study (K1_K01, K1_K06)

Assumptions and objectives of the course:

The aim of the course is to present methods of finding the optimal solution for tasks and engineering problems. The methods are presented that solve technical problems using linear programming as well as nonlinear programming. Problems with- and without constraints are investigated. The student learns different optimization methods that are dedicated to a specific classes of problems (linear problems, nonlinear problems), and take note of multi-criteria optimization methods and methods of optimization using genetic algorithms.

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

Knowledge:

1. The student has an ordered, and mathematically underpinned knowledge in terms of solving the engineering optimization problems using the known optimization methods that are dedicated to both the linear and non-linear problems. - [K2_W00, K2_W03, K2_W07]

2. The student has knowledge in terms of principles of known methods of linear and non-linear programming and is able to use these methods to solve technical optimization problems. - [K2_W00, K2_W03, K2_W07]

3. The student is aware of the advantages and limitations of known optimization methods. - [K2_W00, K2_W03, K2_W07]

Skills:

1. The student is able to give a mathematical description for the linear and non-linear programming tasks and to propose an effective method for solving this problem. - [K2_U05, K2_U11]

2. The student is able to perform optimization of tasks presented in mathematical form using dedicated software with implemented optimization methods. - [K2_U05, K2_U11]

3. The student is able to define the input parameters for the known methods and to propose the stop conditions for methods. - [K2_U05, K2_U11]

Social competencies:

1. The student understands the need for continuous training in order to improve skills. - [K2_K04]

Assessment methods of study outcomes

1. Written and/or oral exam from material presented during lectures.
2. Reports from thematically homogenous laboratory exercises and/or an exam.
3. The project prepared by the student in terms of optimization the selected technical problem.

Course description

Lectures:

1. Extreme of one-variable function ? selected optimization methods.
2. Extreme of multi-variable function ? selected optimization methods.
3. Linear programming for one- and multi-variable functions.
4. Non-linear programming (introduction and description of selected base methods) ? part 1.
5. Non-linear programming (description of selected advanced methods) ? part 2.
6. Solving the technical problems using genetic algorithms.

Laboratories:

1. Selected tools of problems? optimization, simple tasks of linear programming.
2. Solving the problems of linear programming (with- and without constraints).
3. Solving the problems of non-linear programming ? part 1.
4. Solving the problems of non-linear programming ? part 2.
5. Optimization of problems defined by students ? part 1.
6. Optimization of problems defined by students ? part 2.

Basic bibliography:

1. A. Stachurski, Wprowadzenie do optymalizacji, OWPW, 2009.
2. I. N. Bronsztejn (i inni), Nowoczesne kompendium matematyki, PWN, Warszawa 2007.
3. A. Antoniou, W.-Sheng Lu, Practical Optimization. Algorithms and Engineering Applications, Springer, 2010.
4. E. Chong, S. Żak, An Introduction to Optimization, Wiley, 2008.

Additional bibliography:

1. S. S. Rao, Engineering Optimization. Theory and Practice, Wiley, 2009.
2. A. Nowak, Optymalizacja. Teoria i zadania, Gliwice 2007.

Result of average student's workload

Activity	Time (working hours)
1. Lectures (15 hours) + laboratories (15 hours)	30
2. Preparation for laboratory	10
3. The study of the literature and preparing for classes	15
4. Consultations	3
5. Participation in the excercise test	2

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	35	1
Practical activities	30	1