COURSE DESCRIPTION CARD - SYLLABUS

Course name

Optimization methods

Course

Field of study	Year/Semester
Electronics and Telecommunications	2/3
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
Second-cycle studies	english
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	
0	0	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr inż. Damian Karwowski

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Responsible for the course/lecturer:

Prerequisites

The student starting this subject should have systematized knowledge of mathematical analysis, algebra and probability theory. Should be able to obtain information from literature and databases and other sources in English; be able to integrate obtained information, interpret it, draw conclusions and justify opinions.

The student should know the limits of their own knowledge and skills, understand the need for further studying.

Course objective

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. Student learns different optimization methods that are dedicated to a specific classes of problems (linear problems, nonlinear problems), and take note methods of optimization that use genetic algorithms.

Course-related learning outcomes

Knowledge

1. 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.

2. 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.

3. Student is aware of the advantages and limitations of known optimization methods.

Skills

1. Student is able to give a mathematical description for the linear and non-linear programming tasks and to propose an efficient method for solving this problem.

2. Student is able to perform optimization of tasks presented in mathematical form using dedicated software with implemented optimization methods.

3. Student is able to define the input parameters for the known methods and to propose the stop conditions for methods.

Social competences

Student understands the need for continuous training in order to improve skills.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture

Written and / or oral exam. The exam consists of a few to over a dozen questions (depending on the assumed nature of the questions) and concerns the content presented during the lectures. The exact nature of the exam questions will be presented to students during one of the last lectures. Pass threshold: 50% of points.

2. Laboratory classes

Test at the end of the semester. The test consists of several questions checking skills in the area of optimization methods learned. Passing threshold: 50% of points.

Programme content

1. Lecture

Extreme of one-variable function – selected optimization methods.

Extreme of multi-variable function – selected optimization methods.

Linear programming for one- and multi-variable functions.

Non-linear programming (introduction and description of selected gradient-based methods).

Solving the technical problems using genetic algorithms.

2. Laboratory classes

Selected tools of problems' optimization, simple tasks of linear programming.

Solving the problems of linear programming (with- and without constraints).

Solving the problems of non-linear programming. Solving problems with- and without constraints.

Optimization of problems proposed by students.

Teaching methods

1. Lecture

Classes with clear elements of traditional lecture and problem lecture (discussion with students of a specific problem), depending on the content of the presented material. Presentation of optimization methods with examples of their use. Selected contents of the lecture are presented on a multimedia projector or board. The discussion of the issues is accompanied by information on their practical application.

2. Laboratory classes

Solving problems given by the teacher. Interpretation of the received solution and formulation of conclusions. Discussion of the practical application of the methods being the subject of laboratory classes.

Bibliography

Basic

1. S. S. Rao, Engineering Optimization. Theory and Practice, Wiley, 2009.

Additional

1. R. Baldick, Applied Optimization: Formulation and Algorithms for Engineering Systems, Cambridge University Press, 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	31	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for test/exam) [1]	29	0,0

[1] delete or add other activities as appropriate