COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optimization methods [N2EiT1>METOPT]

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

A student starting this course should have a systematic knowledge of mathematical analysis, algebra and probability. Should be able to get information from literature and databases and other sources in Polish or English; be able to integrate the obtained information, interpret it, draw conclusions and justify opinions. The student should know the limitations of his own knowledge and skills, understand the need for further learning.

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. 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.

Course-related learning outcomes

Knowledge:

1. Possesses orderly, mathematically based knowledge in the field of optimization of engineering problems using the known optimization methods dedicated to linear and
non-linear tasks.
2. Has knowledge of the principles of operation of the known methods of linear and non-linear programming and is able to apply these methods to solve technical optimization problems.
3. Is aware of the advantages and limitations of the known optimization methods.

Skills:
1. Can give a mathematical description for linear and non-linear programming tasks and propose an effective optimization method for solving such a problem.
2. Can optimize a task presented in a mathematical form using dedicated software with implemented optimization methods.
3. Can define the input parameters for the known optimization methods and propose an algorithm for the end of calculations in these methods.

Social competence:
The student is open-minded and understands the need for continuous training in order to improve professional qualifications.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture
Pass/written and/or oral exam. The test/exam consists of a few to a dozen of questions (depending on the adopted 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 recent lectures.
Threshold of passing the pass/exam: 50% of total points.

2. Exercises
Colloquium at the end of the semester. The colloquium consists of several questions to test your skills in in the field of known optimization methods. Passing threshold: 50% of total points.

Programme content

Extremum of functions of one variable and functions of many variables. Selected methods of optimizing such functions.

Linear and nonlinear programming for functions of one and many variables. Presentation of selected methods of optimization.

Solving technical problems using optimization methods.

Course topics

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 base methods) – part 1
Non-linear programming (description of selected advanced methods) – part 2
Solving the technical problems using genetic algorithms.

2. Exercises:
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 – part 1.
Solving the problems of non-linear programming – part 2.
Optimization of problems defined by students – part 1.
Optimization of problems defined by students – part 2.

Teaching methods

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

2. Exercises
Solving problems given by the teacher. Interpretation of the obtained solution and formulation of conclusions. Discussion of the possibilities of practical application of the methods being the subject of the exercises.

Bibliography

Primary literature:
1. A. Stachurski, Wprowadzenie do optymalizacji, OWPW, 2009.
2. I. N. Bronsztejn (i inni), Nowoczesne kompendium matematyki, PWN, Warszawa 2007.

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	110	2,00
Classes requiring direct contact with the teacher	35	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	2,00