COURSE DESCRIPTION CARD - SYLLABUS

Course name
Linear and Quadratic programming [S1MNT1>E-PLiK]

Course

Field of study
Mathematics of Modern Technologies

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student starting this subject should have knowledge and skills of the course Numerical Linear Algebra from previous semesters. Should know the limits of their own knowledge and understand the need for further education.

Course objective

Presentation of selected algorithms of linear and quadratic programming.

Course-related learning outcomes

Knowledge:
• has extended and in-depth general knowledge of various branches of higher mathematics, including theorems and proofs, and advanced detailed knowledge about the application of mathematical techniques, methods and tools in engineering and technical sciences [K_W 01(P 6S_W G), K_W 02(P 6S_W G), K_W03(P6S_WG), K_W07(P6S_WG)];
• hasextendedandin-depthknowledgeofmathematicalmodelling[K_W01(P6S_WG),K_W02(P6S_WG), K_W03(P6S_WG), K_W07(P6S_WG)];
• has deepened and theoretically founded knowledge of computer science, including numerical me-

thods; knows at least one software package or a programming language in detail [K_W01(P6S_WG), K_W02(P6S_WG), K_W03(P6S_WG), K_W07(P6S_WG)].

Skills:
• can build and analyse simple mathematical models [K_U 01(P 6S_U W), K_U 02(P 6S_U W), K_U 04(P 6S_U W),
K_U05(P6S_UW), K_U06(P6S_UW), K_U11(P6S_UW), K_U15(P6S_UK), K_U17(P6S_UU)];
• is able to construct an algorithm for solving a simple engineering task as well as implement and test it in a selected programming environment [K_U01(P6S_UW), K_U02(P6S_UW), K_U04(P6S_UW), K_U05(P6S_UW), K_U06(P6S_UW), K_U11(P6S_UW), K_U15(P6S_UK), K_U17(P6S_UU)].

Social competences:
• isawareofthedeepeningandexpandingknowledgetosolvenewtechnicalproblems[K_K02(P6S_KK), K_K03(P6S_KO)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: knowledge acquired during the lecture is verified by a 45 minute colloquium consisting of variously scored questions (test and open); passing threshold: 50% of points; final issues on the basis of which
questions are prepared will be forwarded to students during the lecture preceding the colloquium, or sent by e-mail using the university's e-mail system; Laboratory classes: skills acquired as part of the laboratory are verified on the basis of developed projects and final test; passing threshold: 50% of points.

Programme content

Linear programming
Duality
Integer problems
Flows in networks
Transport issue
Quadratic programming

Course topics

Polyhedrons, vertices and edges
Geometric simplex method
Simplex tableau
Two-phase simplex method
Properties of the simplex method
The theory of duality
Dual method simplex
Discrete optimization
Division and restrictions method
Graphs
Flows in networks
Transportation problem
Quadratic programming - optimality conditions and computational methods.

Teaching methods

Lectures: lecture with presentation supplemented with examples given on the board;
Laboratory classes: laboratories tasks solved using self-written programs as well as ready-made ones.

Bibliography

Basic:
• Horla D., Metody obliczeniowe optymalizacji w zadaniach, WPP, Poznań, 2016;
• Jędrzejczyk Z., Kukuła K., Skrzypek J., Walkosz A., Badania operacyjne w przykładach i zadaniach, PWN, Warszawa, 2016.

Additional:
• Kincaid D., Cheney W., Analiza numeryczna [Numerical Analysis: Mathematics of Scientific Computing (The Sally Series; Pure and Applied Undergraduate Texts, Vol. 2)], WNT, Warszawa 2006;
• Cormen T. H., Leiserson C. E., Rivest R. L., Stein C., Wprowadzenie do algorytmów [Introduction to Algorithms], PWN, Warszawa, 2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00