Bialystok University of Technology									
Field of study	**Computer Science**							**Degree level and programme type**	**Engineer's degree full-time programme**
Specialization/ diploma path	---							**Study profile**	academic
Course name	**Methods of Optimization**							**Course code**	**FCS-00022**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	3
	15				30			**No. of ECTS credits**	**6**

Entry requirements	
Course objectives	Getting students to learn basic terminology of optimization theory and methods of solving optimization problems of various types. Gaining ability to solve selected types of optimization problems.
Course content	1. Linear programming: simplex method, duality. 2. Nonlinear programming: necessary and sufficient optimality conditions for problems without constraints; gradient methods for optimizations without constraints; non-gradient methods for optimizations without constraints; necessary and sufficient optimality conditions for problems with constraints; duality; constrained optimization methods. 3. Calculus of variations: the fundamental problem of the calculus of variations, the Euler—Lagrange equation; variational problems with several variables, the isoperometric problem; the Lagrange problem. 4. Optimal control: formulation of the problem and the Pontryagin Maximum Principle.
Teaching methods	laboratory exercises, subject exercises, informative lecture, programming,
Assessment method	written exam, written in-class tests, evaluation of exercises completion

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
LO1	has a theoretical knowledge on optimization theory and methods which allows to analyze and to model data and real world processes	K_W01 K_W05
LO2	knows the standard procedures in the optimization, including software for solving optimization problems	K_W01
LO3	is able to use knowledge from various areas of mathematics in solving optimization problems	K_U01 K_U02
LO4	formulates various optimization problems; is able to choose a suitable method to solve optimization problems; is able to solve himself using software a simple optimization problem;	K_U02

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	written exam	L
LO2	written exam	L
LO3	written in-class tests	SW
LO4	evaluation of exercises completion, written in-class tests	SW

Student workload (in hours)		No. of hours
Calculation	1 - Attendance at lectures -	15
	2 - Attendance at classes and specialistic workshop -	30
	3 - Reports from the workshop and completion of homework -	45
	4 - Preparing for exercises, laboratory tests and in-class tests -	25
	5 - Participation in student-teacher sessions -	5
	6 - Preparation for exam -	28
	7 - Presence during exam -	2
	TOTAL:	**150**

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	52 (1)+(2)+(5)+(7)	2.1
Student workload – practical activities	100 (2)+(3)+(4)	4.0

Basic references	1. A. Ruszczyński, Nonlinear optimization, Princeton, Oxford:Princeton University Press, 2006. 2. D. G. Luenberger, Linear and Nonlinear Programming, Reading, Massachusetts : Addison-Wesley Publ., 1984. 3. I. M. Gelfad, S. V. Fomin, Calculus of Variations, Courier Dover Publications, 2000.
Supplementary references	1. Donald E. Kirk, Optimal control theory : an introduction / Englewood Cliffs : Prentice-Hall, 1970. 2. B.C. Chachuat, Nonlinear and dynamic optimization: From Theory to Practice, Ecole Polytechnique Federale de Lausanne, IC-32: Winter Semester 2006/2007, https://infoscience.epfl.ch/record/111939/files/Chachuat_07(IC32).pdf
Organisational unit conducting the course	Software Department
Author of the programme	dr inż. Magdalena Topczewska

Date of issuing the programme	
	Feb. 17, 2022

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW – field work,S – seminar