

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 isoperimetric problem; the Lagrange problem. 4. Optimal control: formulation of the problem and the Pontryagin Maximum Principle.								
Teaching methods	informative lecture, programming, subject exercises, laboratory exercises,								
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	
<b>TOTAL:</b>							<b>150</b>		
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, <a href="https://infoscience.epfl.ch/record/111939/files/Chachuat_07(IC32).pdf">https://infoscience.epfl.ch/record/111939/files/Chachuat_07(IC32).pdf</a>								
Organisational unit conducting the course	Software Department							Date of issuing the programme	
Author of the programme	dr inż. Magdalena Topczewska							Feb. 17, 2022	

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