

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	Algorithmics - Selected Issues							Course code	FCS-00098
								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	Algorithms and Data Structures (FCS-00020),								
Course objectives	The aim of the course is to develop the ability to construct a graph or network model for real problems. The student will be learn: methods of determining the shortest paths in graphs, methods of designing effective solutions for network flow problems, methods of constructing effective heuristics for computationally difficult graph problems. The student will develop the skills of: designing computationally effective algorithms and data structures for graph problems, assessing the effectiveness of applied solutions, identifying computationally difficult problems and using approximate solutions for these problems. The aim of the course is also to develop the ability to communicate effectively in the field of engineering and scientific problems with representatives of other branch of life.								
Course content	<p>Lecture:</p> <p>Graph browsing algorithms. BFS and DFS methods and their applications.</p> <p>Effective path algorithms for graphs with weights. Strategies: label-setting and label-correcting.</p> <p>The problem of maximum flow in the network and effective methods of its determination.</p> <p>The problem of the cheapest flow in the network - effective algorithms and examples of application.</p> <p>Graph and network problems difficult to solve. Examples of approximate solutions for graph problems of the NPC class.</p> <p>The traveling salesman problem and its variants. Examples of applications of various types of traveling salesman problems in information systems in the field of logistics and e-tourism class systems.</p> <p>Effective approximation algorithms for different varieties of the traveling salesman problem.</p> <p>The problem of routing in transport networks.</p> <p>Specialist workshop:</p> <p>A problem task that requires the development of an algorithm based on BFS and DFS graph searching methods</p> <p>A problem task that requires the development of an algorithm based on the use of path algorithms</p> <p>A problem task that requires the development of an algorithm based on the use of networkflow algorithms</p> <p>A problem task that requires the development of an algorithm based on the use of approximation algorithms.</p>								
Teaching methods	lecture problem, programming,								
Assessment method	Lecture- test specialist workshop- projects								
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study	
LO1	knows and understands the concepts related to algorithmics in the field of graph and network issues							K_W05	
LO2	knows and understands the operation of standard methods of designing effective graph and network algorithms							K_W07	
LO3	student can build a graph or network model for a problem formulated with the language of practice							K_W07	
LO4	student can design effective solutions for an identified graph or network problem and describe them using nomenclature and concepts appearing in the created model							K_W06	
LO5	student can assess the quality of proposed solutions, carry out their correctness and computational complexity tests							K_W06	
Symbol of learning outcome	Methods of assessing the learning outcomes							Type of tuition during which the outcome is assessed	
LO1	test-lecture,							L	
LO2	test							L	
LO3	test-lecture programs- specialists workshop							L, Sw	
LO4	programs on specialist workshop							Sw	
LO5	programs on specialist workshop							Sw	
Student workload (in hours)								No. of hours	
Calculation	1 - participation in the lecture - 15x1h							15	
	2 - participation in the specialist workshop - 15x2h							30	
	3 - preparation to the specialist workshop -							30	
	4 - Implementation of problem tasks of the specialist workshop -							35	
	5 - Participation in consultations -							10	
	6 - Preparation for completing the course -							30	
<b>TOTAL:</b>								<b>150</b>	
Quantitative indicators								HOURS	No. of ECTS credits
<b>Student workload - activities that require direct teacher participation</b>								55 (2)+(1)+(5)	2.2
<b>Student workload - practical activities</b>								105 (2)+(3)+(5)+(4)	4.2
Basic references	1. Ravindra K Ahuja Thomas L Magnanti; James B Orlin- Network flows : theory, algorithms, and applications 1993 2. T. H. Cormen, Introduction to algorithms, 3. Nacima Labadie, Christian Prins, and Caroline Prodhon- Metaheuristics for Vehicle Routing Problems, 2016								
Supplementary references	1. Ravindra K Ahuja Thomas L Magnanti; James B Orlin- Network flows : theory, algorithms, and applications								
Organisational unit conducting the course	Department of Theoretical Computer Science							Date of issuing the programme	
Author of the programme	dr Joanna Karbowska-Chilińska							Feb. 17, 2022	

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