

Subject card

Subject name and code	Combinatorial Optimization, PG_00191665						
Field of study	Informatics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		5.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Paweł Żyliński				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		0.0		65.0	125
Subject objectives	A review of advanced algorithmic methods based on applications in graph theory, computational geometry, and other optimization issues. Familiarizing students with English nomenclature.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[INFOL3_U06] is able to select and apply appropriate IT methods and tools to solve complex problems, is able to use acquired knowledge by appropriately selecting sources and information derived from them, and perform evaluation, critical analysis, and synthesis of this information		Can select an appropriate algorithmic method for a complex optimization problem, implement it, and critically evaluate the solution, using sources incl. English-language literature and nomenclature.		[SU2] presentation/project/paper/report [SU4] test/exam - oral or written		
	[INFOL3_W03] knows and understands advanced concepts in the field of algorithms and data structures, formal languages, automata theory and computational complexity, and artificial intelligence		Knows advanced algorithmic methods of combinatorial optimization — network flows, approximation algorithms and schemes, randomized algorithms, the sweep-line technique and linear programming — with their properties and complexity.		[SW4] test/exam - oral or written		
	[INFOL3_U02] is able to use his/her knowledge of higher mathematics to model and solve complex problems		Can model an optimization problem (graph theory, computational geometry, or as a linear program) and apply the appropriate mathematical apparatus to solve it and analyse solution quality (approximation ratio, probabilistic analysis).		[SU4] test/exam - oral or written		

Subject contents	1. Flows in networks with applications. 2. Approximation algorithms and approximation schemes. 3. Randomized algorithms. 4. Sweep-line technique. 5. Linear programming.		
Prerequisites and co-requisites	1. Discrete mathematics. 2. Linear algebra with analytic geometry. 3. Algorithms and data structures. 4. Graph and network theory (basics). 5. Programming skills.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	final test	51.0%	20.0%
	test	51.0%	40.0%
	implementing/coding	51.0%	40.0%
Recommended reading	Basic literature	1. M. de Berg, M. van Kreveld, M. Overmars, O. Schwarzkopf: Computational Geometry - Algorithms and Applications, Springer (2000) 2. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein: Introduction to Algorithms, MIT (2022) 3. S. Dasgupta, C.H. Papadimitriou, U.V. Vazirani: Algorithms, McGraw-Hill Higher Education (2006) 4. V.V. Vazirani: Approximation Algorithms, Springer (2003)	
	Supplementary literature	1. S. Har-Peled: Geometric Approximation Algorithms, AMS (2011) 2. R. Motwani, P. Raghavan: Randomized Algorithms, Cambridge University Press (1995) 3. F.P. Preparata, M.I. Shamos: Computational Geometry: An Introduction, Springer (1985) 4. M.M. Sysło, N. Deo, J.S. Kowalik: Algorytmy optymalizacji dyskretnej, PWN (1999)	
	eResources addresses		
	Example issues/ example questions/ tasks being completed	not available	
Work placement	Not applicable		

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