GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Team Strategies, PG_00047516		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Optional subject group Specialty subject group 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	1	Language of instruction	English
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tomasz Białaszewski	
	Teachers	dr inż. Tomasz Białaszewski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30	4.0	16.0	50

Subject objectives	Supplementing students' knowledge about selected optimization methods based on the approach of swarm intelligence

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student is able to implement a selected swarm intelligence algorithm that solves the optimization task.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Student can explain the mechanisms used in the algorithms of swarm intelligence	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	Student is able to choose the appropriate swarm intelligence algorithm for the machine learning problem under consideration	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

1. Course organization and assessment rules. 2. Overview of the course topics. 3. Review of methods and definitions of concepts related to swarm intelligence. 4. Ant Colony Optimization algorithm. 5. Firefly algorithms. 6. Stochastic Diffusion Search. 7. Gravitational Search Algorithm. 8. Artificial Bee Colony algorithm. 9. Cuckoo Search algorithm. 10. Invasive Weed Optimization algorithm. 11. Biogeography-Based Optimization algorithm. 12. Charged System Search. 13. Intelligent Water Drops algorithm. 14. River Formation Dynamics algorithm. 15. Imperialist Competitive Algorithm. 16. Applications of swarm intelligence methods in engineering problems.

Course content – project

Implementation of selected swarm intelligence algorithms; analysis of their explorationexploitation properties; comparison of their effectiveness, convergence speed, and stability; and evaluation of their applicability to engineering optimization problems.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	25.0%	40.0%
Exam	50.0%	60.0%

Recommended reading	Basic literature	1. M. Dorigo and T. St utzle, Ant Colony Optimization. MIT Press, Cambridge, MA, 2004 2. Sayadi, M. K.; Ramezanian, R.; Ghaffari-Nasab, N. (2010). "A discrete firefly meta-heuristic with local search for make span minimization in permutation flow shop scheduling problems". Int. J. of Industrial Engineering Computations 1: 110.Computations 1: 110.4. 3. K.N. Krishnanand and D. Ghose. Glowworm swarm optimization for simultaneous capture of multiple local optima of multi-modal functions. Swarm Intelligence, Vol. 3, No. 2, pp.87124, June 2009. 4. X.-S. Yang; S. Deb (December 2009). "Cuckoo search via Lévy flights". World Congress on Nature &Biologically Inspired Computing (NaBIC 2009). IEEE Publications. pp. 2102142.' 5. Kaveh A, Talatahari S. A novel heuristic optimization 2.KavehA, TalatahariS. A novel heuristic optimization method: charged system search,Acta Mechanica, 2010, DOI: 10.1007/ s00707-009-0270-4. 6. Shah-Hosseini, Hamed (2009). "The intelligent water drops algorithm: a nature-inspired swarm-based optimization algorithm". International Journal of Bio-Inspired Computation1(1/2): 71792. 7. Rashedi, E.; Nezamabadi-pour, H.; Saryazdi, S. (2009). 2.Rashedi, E.; Nezamabadi-pour, H.; Saryazdi, S. (2009). "GSA: a gravitational search algorithm". Information Science 179 (13): 22322248 8. Meyer, K., Nasuto, S.J. & Bishop, J.M., (2006), Stochastic Diffusion Optimization: the application of partial function evaluation and stochastic recruitment in Swarm Intelligence optimization, Volume2, Chapter12 in Abraham, A., Grosam, C., & Ramos, V. (eds), (2006), Swarm Intelligence and data mining, Springer-Verlag
	Supplementary literature	1. E. Bonabeau, M. Dorigo, and G. Theraulaz, Swarm Intelligence: From Natural to Artificial Systems. Oxford University Press, 1999. 2. www.aco-metaheuristic.org 3. www.metaheuristics.org 4. www.bees-algorithm.com
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Present and describe the steps of the Stochastic Diffusion Search (SDS) approach. 2. Explain the mechanism to modify the position of the agent in the Intelligent Water Drops (IWD) algorithm. 3. Characterize the mechanism of appropriate balance between exploration and exploitation in the Gravitational Search Algorithm (GSA).	
Practical activites within the subject	Not applicable	

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