GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Team Strategies, PG_00048467						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	February 2025		Academic year of realisation of subject	2025/2026			
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	Polish			
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						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tomasz Białaszewski					
	Teachers	dr inż. Tomasz Białaszewski					
Lesson types and methods of instruction	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	The main objective of the course is to familiarize students with the basic problems of collaborative strategies such as the use of particle swarm algorithm, the ant algorithm, stochastically distributed search algorithms making team strategy, multi-agent systems, modeling of intelligent co-operation, simulations of social behavior. Passing is realized through the exam and execution of the project						

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 choose the appropriate swarm intelligence algorithm for an exemplary machine learning problem	[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 is able to implement the selected swarm intelligence algorithm for a given optimization problem	[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 explain the mechanisms used in swarm intelligence algorithms	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

<table>
<tr><td>Subject contents</td><td>1. Organization of the course and assessment criteria

2. Discussion of the course topics

3. Review of methods and definitions of swarm intelligence

4. Ant colony optimization algorithm

5. Fireflies algorithms

6. Stochastic diffusion search

7. Gravitational search algorithm

8. Bees algorithm

9 Cuckoo search

10. Krill herd algorithm

11. Charged system searched

12. Magnetic optimization algorithm

13. Intelligent water drops

14. River formation dynamics

15. Artificial immune systems

16 Application of swarm intelligence methods to engineering problems</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>25.0%</td><td>40.0%</td></tr>
<tr><td>Exam</td><td>50.0%</td><td>60.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td>Basic literature</td><td>Engelbrecht A., Fundamentals of Computational Swarm Intelligence, Wiley & Sons. ISBN 0-470-09191-6

Hamed Shah-Hosseini, Problem solving by intelligent water drops, in Proc. IEEE Congress on Evolutionary Computation, Swissotel The Stamford, Singapore, Sep. 2007.

Kennedy J. and Eberhart R.C., Swarm Intelligence. ISBN 1-55860-595-9

Reynolds C., Flocks herds and schools: A distributed behavioral model, SIGGRAPH "87: Proceedings of the 14th annual conference on Computer graphics and interactive techniques (Association for Computing Machinery): 25--34, 1987</td></tr>
</table>

	Supplementary literature	Beni, G., Wang, J. Swarm Intelligence in Cellular Robotic Systems, Proceed. NATO Advanced Workshop on Robots and Biological Systems, Tuscany, Italy, June 26–30 (1989) Civicioglu, P., and Besdok, E., (2011), A conception comparison of the cuckoo search, particle swarm optimization, differential evolution and artificial bee colony algorithms, Artificial Intelligence Review, DOI 10.1007/s10462-011-92760, 6 July (2011). Yang X. S., (2008). Nature-Inspired Metaheuristic Algorithms. Frome: Luniver Press. ISBN 1-905986-10-6 Krishnanand K.N. and D. Ghose (2006) "Glowworm swarm based optimization algorithm for multimodal functions with collective robotics applications". Multi-agent and Grid Systems, 2 (3): 209–222 Wooldridge M., An Introduction to MultiAgent Systems, John Wiley & Sons Ltd, 2002
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Describe the algorithm scheme of the river dynamic formation (RDF). Explain the difference between the firefly algorithm (FA) and the glowworm swarm optimization (GSO). Explain how to modify the gravitational search algorithm (GSA) to increase its effectiveness? Describe the main characteristics of the max-min ant system algorithm (MMAS). Briefly describe the steps of charged system search(CSS). Describe the two basic properties of intelligent water drops algorithm IWD	
Work placement	Not applicable	

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