# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

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| Subject name and code | Team Strategies, PG_00048467 |
| Field of study | Automatic Control, Cybernetics and Robotics |

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| Date of commencement of studies | February 2026 | Academic year of realisation of subject | 2026/2027 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>Specialty subject group<br>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 |

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| Conducting unit | Department Of Decision Systems And Robotics -> Faculty Of Electronics Telecommunications And Informatics -> Wydziały Politechniki Gdańskiej |

| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Tomasz Białaszewski |
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| | 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 |

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| 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_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 | [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment |
| | [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_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 | [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment |

| Subject contents | 1. Organization of the course and assessment criteria |
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| | 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 |
| Prerequisites and co-requisites | |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| --- | --- | --- | --- |
| | Exam | 50.0% | 60.0% |
| | Project | 25.0% | 40.0% |

| Recommended reading | Basic literature | 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 |

| | 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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