



DOCTORAL
SCHOOL
AT GDAŃSK
UNIVERSITY
OF TECHNOLOGY

Course: Modern optimisation methods

Teaching hours: 20h

Prerequisites: The course is primarily open to all PhD students at Gdansk University of Technology.

This course is compulsory for PhD students assigned to mechanical engineering as well as applied mathematics tracks at Doctoral School at Gdańsk University of Technology

Course outline

Content

This module is all about getting the student to be prepared to conduct advanced global optimisation processes. The sessions provide essential information that you require to understand modern and contemporary optimisation method applied to all branches of mechanical and physical problems. The course is designed to deliver to students knowledge on modern optimisation methods and algorithms. Throughout the course the students should gain skills to understand and conduct research based on global optimisation methods.

General topics coverage:

1. Classification of optimisation problems
2. Single-point, derivative-based algorithms
3. Single-point, derivative-free algorithms
4. Multi-point, derivative-free algorithms
5. Statistical analysis of algorithms
6. Constraints
7. Variational calculus
8. Multi-objective optimisation
9. Engineering applications

Teaching mode

There will be 20 hours of lectures, to be completed during the first and/or second semesters of PhD programme. The teaching method is basically presentation

combined with examples. During the course students will be asked to participate in lecture classes. The course is entirely delivered in English.

Examination

A wide range of formative feedback from your tutor, questions and practical individual and group exercises will be used by tutors to aid learning as will exercises to encourage the researchers' abilities in critical and reflective learning. The exact nature of these assessment devices will be at the discretion of the tutor. The PhD students will be required to demonstrate their skills, knowledge and understanding of global optimisation methods during an oral/written examination.

Fundamental readings:

1. Tesch, K.: Continuous optimisation algorithms, GUT Publishers, Gdansk (2016)
2. Storn, R., and Price, K. 1997. "Differential evolution-A simple and Efficient Heuristic for Global Optimization over Continuous Spaces." *Journal of Global Optimization*, 11: 341-359
3. Kennedy, J., Eberhart, R. 1995. "Particle Swarm Optimization". *Proceedings of IEEE International Conference on Neural Networks IV*. 1942-1948
4. Yang, X. S. 2009. "Firefly algorithm, stochastic test functions and design optimisation." *International Journal of Bio-inspired Computation* 2 (2): 78-84
5. Michalewicz, Z., 1996. "Genetic Algorithms + Data Structures = Evolution Programs". 3rd ed. Berlin, Heidelberg, New York: Springer