DOCTORAL (PHD) STUDIES

COURSE UNIT DESCRIPTION

Course unit title	Scientific areas	Faculty	Institute, department
Optimization methods and their applications	Informatics (N 009)	Faculty of Mathematics and Informatics	Institute of Data Science and Digital Technologies, Global Optimization Group

Study method	Number of credits	Study method	Number of credits
Lectures	1 (autumn sem.)	Consultations	1
Individual works	4	Seminars	1

Summary

Optimization is the search of the best solution (alternative). When there are too many alternatives to consider or even infinitely many, formal methods and algorithms are needed. The goodness of a solution is defined by a criterion – price, risk, reliability, time, length or similar. In the formal definition of optimization problem the criterion is defined as an objective function, the minimal value of which is searched – a solution with the smallest value of the objective function should be found. The purpose of this course is to provide knowledge of optimization theory and skills to formulate optimization problems and solve them using suited optimization algorithms.

Topics:

- Classification of optimization problems and methods
- Optimization tools and modelling languages
- Unconstrained optimization
- Constrained optimization
- Linear programming
- Combinatorial optimization
- Global optimization
- Multilevel optimization
- Multi-objective optimization
- Covering methods for global and multi-objective optimization, simplicial global optimization
- Heuristic algorithms for global, combinatorial, multi-objective optimization

Practical assignment: define adequate optimization problem for a certain application, choose suited algorithms, develop software implementing the algorithms, perform numerical investigation solving test problems and comparing with results of other authors.

Main literature

Edwin K. P. Chong, Stanislaw H. Zak. 2013. An Introduction to Optimization. Wiley. ISBN: 978-1-118-27901-4

B. Guenin, J. Könemann, L. Tunçel. 2014. A Gentle Introduction to Optimization. Cambridge University Press. ISBN: 978-1107658790
P.M. Pardalos, A. Žilinskas, J. Žilinskas. 2017. Non-Convex Multi-Objective Optimization. Springer, ISBN 978-3-319-61005-4
M. Bazaraa, H. Sherali, C. Shetty. 2006. Nonlinear Programming Theory and Algorithms. John Wiley & Sons. ISBN 9780471486008
R. J. Vanderbei. 2014. Linear Programming. Springer US, ISBN 978-1-4614-7629-0
S. Dempe, V. Kalashnikov, G. A. Pérez-Valdés, N. Kalashnykova. 2015. Bilevel Programming Problems. Springer. ISBN 978-3-662-45826-6
R. Paulavičius, J. Žilinskas (2014) Simplicial Global Optimization. Springer, ISBN 978-1-4614-9092-0

Lecturer(s) (name, surname)	Science degree	Main publications
Julius Žilinskas	PhD	https://www.elaba.mb.vu.lt/dmsti/?aut=Julius+Žilinskas
Remigijus Paulavičius	PhD	https://www.elaba.mb.vu.lt/dmsti/?aut=Remigijus+Paulavičius
Algirdas Lančinskas	PhD	http://www.elaba.mb.vu.lt/dmsti/?aut=Algirdas+Lančinskas