

Modern Methods of Optimization

Subject area: Mathematics

University: CTU
Level: BA2
Teaching mode: hybrid: some students participate online, other students attend real-life
Instructor(s): Jan Zeman, Matěj Lepš

Short description

The goal of the course is to obtain an understanding of basic principles and terminology of mathematical optimization as well as approaches to global stochastic methods. The theoretical exposition will be complemented with practical solution of selected optimization problems using publicly available toolboxes in MATLAB environment.

Full description

The course covers the following topics:

1. Introduction to optimization.
2. Principles of Mathematical Programming with emphasis on the Newton method
3. Direct Search methods, Simulated Annealing, Threshold Acceptance
4. Genetic Algorithms
5. Evolution Strategies, Differential Evolution, PSO and ACO
6. Parallel Evolutionary Algorithms and No free lunch theorem
7. Multi-modal optimization, comparison of optimization algorithms,
8. Multi-objective optimization, constrained optimization
9. Meta-modeling,
10. Introduction to Genetic Programming
11. Examples of engineering applications

Learning outcomes

- Understand the differences between mathematical and nature-inspired optimization methods
- Obtain an overview of available techniques in both fields
- Obtain basic hands-on experience in solving simple problems with available libraries

General information

Contact hours per week:	2
Total workload:	50 (in student hours for the whole course)
ECTS credits:	2
Language:	English

Course start date: 19 September 2022

Course end date: 15 January 2023

Add. info about start date: Start course date refers to start of the semester at CTU. Schedules will be available 1-2 weeks before semester starts. Lectures are taken place from 19.9.2022 until 15.1.2023. Examination period from 16.1.2023 until 19.2.2023.

Weekly teaching day/time:

Time zone: CET (Denmark, Germany, France, Netherlands, Switzerland, Czech Republic)

Further information:

Prerequisites: Basic of calculus, linear algebra, and statics are welcome but will be repeated during the course.

Activities and methods: Lectures, Seminars

Presence on campus: no

Final examination

Form: written, a collaborative project

Date:

Location/format:

Re-sit possibility: yes

Transcript available: end of semester

Add. info/requirements: The students can complete the course by passing the final test or by working on a project problem.

Registration

To register for this course, follow the registration requirements of your **home university** as specified here: www.euroteq.eu/courses-registration.

Administration

Number of places:	20
Minimum participants:	1
Internal course code:	132MMO
Contact:	matej.leps@fsv.cvut.cz, jan.zeman@cvut.cz

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