

## Tárgytematika / Course Description

### Optimization of Discrete Systems

**GKNM\_INTA060****Tárgyfelelős neve /****Teacher's name:** Tüű-Szabó Boldizsár Vilmos**Félév / Semester:** 2021/22/2**Beszámolási forma /****Assesment:** Vizsga**Tárgy heti óraszám /****Teaching hours(week):** 2/2/0**Tárgy féléves óraszám /****Teaching hours(sem.):** 0/0/0

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### OKTATÁS CÉLJA / AIM OF THE COURSE

This course aims to teach different, high-level discrete optimization approaches to the students. From the exact solution methods, Constraint Programming is presented in detail, then various metaheuristics are discussed. Students of this course get to know discrete optimization problems and their solution techniques, which are widely used in areas of both engineering and management, which makes this knowledge highly valuable in research and development.

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### TANTÁRGY TARTALMA / DESCRIPTION

- week 1 Solving satisfiability problems with simple, intuitive approach
- week 2 From backtracking search to constraint propagation
- week 3 Constraint Programming (CP) modeling: variables and domains, constraints, objective function
- week 4 Using the MiniZinc and FlatZinc modeling languages and CP solvers
- week 5 Global constraints and why to use them
- week 6 Improving CP models: removing redundant and sub-optimal solutions from the search space
- week 7 CP search strategies: variable and value selection methods
- week 8 The Local Search heuristic
- week 9 Tabu Search and Simulated Annealing methods
- week 10 Population-based optimization
- week 11 Genetic Algorithm: genes, mutation, crossover
- week 12 Implementation of evolutionary algorithms
- week 13 Bacterial, memetic, and other variants of evolutionary algorithms
- week 14 Exploring the ant-colony and particle swarm optimization methods

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### SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESSMENT'S METHOD

Prerequisites of final exam: successful practical midterm exam

Final exam: written exam with theory and a complex practical exercise, then oral presentation of the solution of the practical exercise

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## **KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL**

Francesca Rossi - Peter van Beek - Toby Walsh: Handbook of Constraint Programming, 2006, Elsevier Science Inc., New York, NY, USA

Michel Gendreau, Jean-Yves Potvin: Handbook of Metaheuristics, 2010, Springer, Boston, MA, USA

Eiben, A.E., Smith, James E.: Introduction to Evolutionary Computing, 2003, Springer-Verlag Berlin Heidelberg