RTU Course "Optimization Methods in Logistics"

12111 Modelēšanas un imitācijas katedra

General data

Code	DMI715
Course title	Optimization Methods in Logistics
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Computer Science
Responsible instructor	Gaļina Merkurjeva
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Possibility of distance learning	Not planned
Abstract	The course starts with an overview of different optimization methods and techniques applied in logistics, and software review. The following optimization methods are considered in the course: Mathematical Programming (Linear Programming (LP), Integer Programming (IP), and Dynamic Programming); Numeric Optimization (Tree/Graph Search methods – Branch & Bound); Heuristic Optimization and Metaheuristics (Greedy, Tabu, Simulated Annealing, Genetic Algorithms, Evolutionary Strategy); Constraint Programming and Simulation-based Optimization. In the practical part of the course different optimization algorithms are applied to benchmark optimization problems in logistics by using the heuristic optimization environments and simulation-based optimization software tools, and a case study in logistics optimization is developed in groups.
Goals and objectives of the course in terms of competences and skills	Competences and skills demonstrated: know of different optimization methods, techniques, software and their application aspects; identify the problem to be optimized and select an appropriate optimization method; apply optimization software to solve practical tasks in logistics optimization.
Structure and tasks of independent studies	In the practical part of the course different optimization algorithms are applied to benchmark optimization problems in logistics by using heuristic optimization environments and simulation-based optimization software tools, and a case study in logistics optimization is developed in groups.
Recommended literature	1. D. Goldberg, Genetic algorithms in search, optimization, and machine learning, Addison Wesley Longman, Inc, 1989 2. M. Affenzeller, etc. Genetic Algorithms and Genetic Programming: Modern Concepts and Practical Applications, Chapman & Hall/CRC, 2009. 3. J.Dréo, etc. Metaheuristics for Hard Optimization. Methods ad Case Studies, Springer-Verlag, 2006. 4. A. Gosavi, Simulation-based Optimization: Parametric Optimization Techniques and Reinforcement Learning. Kluwer Academic Publishers, 2003.
Course prerequisites	Mathematics

Course outline

Theme	Hours
Introduction (overview of optimization problems in Logistics, classification of optimization techniques and software)	4
Mathematical Programming (Linear Programming (LP), Integer Programming (IP), Dynamic Programming)	6
Numeric Optimization (Tree/Graph Search methods – Branch & Bound)	2
Heuristic Optimization and Metaheuristics (Greedy, Tabu, Simulated Annealing, Genetic, Evolutionary Strategy)	8
Constraint Programming	2
Simulation-based Optimisation	2
Practical assignments (logistics optimisation problems solving by means of optimisation software)	4
Case study (specifying, solving, discussing)	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
To be able to use different optimization methods to benchmark optimization problems.	Successfully performed practical assignments in the course.
To be able to identify and formalize the problem to be optimized, and select an appropriate optimization method to solve the problem.	Demonstrated abilities to identify the problem to be optimized, mathematically formulate its structure and select an appropriate optimization method for problem solving. (A case study).
To be able to apply optimization techniques and software tools to solve practical tasks in logistics optimization.	Demonstrated abilities to use optimization techniques and software tools to solve practical tasks in logistics optimization (A case study).

To be able to describe and interpret optimization methods and techniques, and their application aspects to optimization problem solving in logistics.	Demonstrated ability to identify a specific subject and provide an augmented explanation (Course exam).

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	3.0	1.5	0.0	0.5		*	