Subject code	ECTS credits
MAT5018	6

Course title in Lithuanian

OPERACIJŲ TYRIMAS

Course title in English

OPERATIONS RESEARCH

Short course annotation in Lithuanian (up to 500 characters)

Šis kursas — tai įvadas į operacijų tyrimą. Pagrindinis dėmesys kreipiamas į tiesinių deterministinių uždavinių sprendimo metodus ir rezultatų analizę. Temos apima tiesinio programavimo uždavinių savybes, dualumo teoriją, jautrumo analizę, sveikaskaitį programavimą, tikslinį programavimą, dinaminį programavimą ir matricinius lošimus.

Short course annotation in English (up to 500 characters)

This course is an introduction to operation research, with an emphasis on techniques for the solution and analysis of deterministic linear models. The topics covered include: mathematical properties of linear programming models, duality theory, sensitivity analysis, integer programming, goal programming, dynamic programming and matrix games.

Prerequisites for entering the course

Algebra, Optimization Methods.

Course aim

To provide knowledge in the main models of operation research. To familiarize with possibilities of solving and analysis of all these problems using R programing language.

Links between course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment

No	Course outcomes	Criteria of learning achievement evaluation	Study methods	Methods of learning achievement assessment
1.	Basic concepts of linear, integer and goal programming.	Student is able identify and solve problems which can be formulated as a linear, integer and goal programming problem.	Lectures, practical works, individual work, consulting.	Final exam, mid-term exam, assessment of practical works.
2.	Understanding the relationship between a linear programming problem and its dual.	Student is able to formulate, write and solve dual problem.	Lectures, practical works, individual work, consulting.	Final exam, mid-term exam, assessment of practical works.
3.	Apply mathematical techniques in network models and scheduling problems.	Student is able to solve network models like the shortest path and maximum flow problems.	Lectures, practical works, individual work, consulting.	Mid-term exam, assessment of practical works.
4.	Understanding how to model and solve problems using dynamic programming.	Student recognizes problems, which can be solved using dynamic programming approach.	Lectures, practical works, individual work, consulting.	Final exam, mid-term exam, assessment of practical works.
5.	Understand the mathematical tools that are needed to solve optimisation problems.	Student is able to formulate a real-world problem as a mathematical model and solve it using R software.	Lectures, practical works, individual work, consulting.	Mid-term exam, assessment of practical works.

Links between study programme outcomes and course outcomes

Study programme outcomes	Running number of course outcome				
	1	2	3	4	5
1. Deepen and expand general knowledge of mathematics and apply it in a new non-standard environment	+	+	+	+	+

2. Broaden and apply the knowledge of mathematical modelling for the economy and technical systems	+	+	+	+	+
4. Identify, select and understand the state-of-the-art literature of mathematics and apply the gained knowledge to specific scientific and practical tasks	+	+	+	+	+
5. Develop mathematical models integrating the knowledge from various fields and different mathematical modelling techniques, and analyse the modelling results assessing the model adequacy and accuracy			+	+	+
7. Analyse, understand and use mathematical methods	+	+	+	+	+
12. Make decisions independently					+

Content

No	Content (topics)
1.	Linear programming models. Simplex method.
2.	Integer programming. Branch and bound algorithm.
3.	Dual and primal problems. Sensitivity analysis.
4.	Goal programming.
5.	Dynamic programming.
6.	Network models.
7.	Matrix and bimatrix games. Optimal strategies.
8.	Project management models. Critical path method.
9.	Nonlinear programming.

Distribution of workload for students (contact and independent work hours)

Lectures	**45 hours**
Practical work	**15 hours**
Individual students work	**100 hours**
Total:	**160 hours**

Structure of cumulative score and value of its constituent parts

Final written exam (50%), mid-term written exam (25%), assessment of practical works (25%).

Recommended reference materials

No	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self study rooms*	*Other libraries*
Basic materials						
1.	2011	Taha H.A. Operation reseach. An introduction.	Prentice Hall		1	
2.	1990	Čiočys V., Jasilionis R. Matematinis programavimas	Vilnius, Mokslas	1	1	
Supplementary materials						
1.	2008	Matoušek J., Gärtner B. Understanding and Using Linear Programming	Springer			
2.	2003	Vakrinienė S. Operacijų tyrimas programine įranga SAS/OR	Vilnius, Technika			

Course programme designed by

Assoc. prof. dr. Tomas Rekašius