| Subject code | ECTS credits |
|---|---|
| MAT3016 | 6 |

**Course title in Lithuanian**

**OPTIMIZAVIMO METODAI**

**Course title in English**

**OPTIMIZATION METHODS**

**Short course annotation in Lithuanian (up to 500 characters)**

Įgyjamos esminės optimizavimo metodų žinios, susipažįstama su pagrindiniais optimizavimo uždavinių tipais, tiesinio programavimo uždaviniais ir jų sprendimo metodais, dualiaisiais uždaviniais, transporto uždaviniais, tinklų uždaviniais, daugiakriteriniu optimizavimu, netiesiniu programavimu.

**Short course annotation in English (up to 500 characters)**

Acquired knowledge of basic concepts of optimization theory: main types of optimization problems. Solution methods of linear optimization problems: graphical solution method, Simplex method. Dual problems. Transportation problem. Network models. Multicriteria optimization. Nonlinear programming.

**Prerequisites for entering the course**

Mathematical Analysis, Algebra, Discrete Mathematics

**Course aim**

Course aim is to provide knowledge of basic concepts of optimization theory.

**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 | Knowledge and understanding of linear programming problems. | Student demonstrates the ability to identify and solve linear programming problems. | Lectures, practical works, individual work, group work, consulting | Mid-term exam, assessment of practical works |
| 2 | Understanding the relationship between a linear programming problem and its dual. | Student demonstrates the ability to formulate and solve dual problem. | Lectures, practical works, individual work, consulting | Mid-term exam, assessment of practical works |
| 3 | Knowledge and understanding of transportation problems. | Student demonstrates the ability to identify and solve transportation problems. | Lectures, practical works, individual work, group work, consulting | Mid-term exam, assessment of practical works |
| 4 | Knowledge and understanding of discrete and integer programming problems. | Student demonstrates the ability to identify and solve discrete and integer programming problems. | Lectures, practical works, individual work, group work, consulting | Final exam, assessment of practical works |
| 5 | Knowledge of mathematical techniques in network models. | Student demonstrates the ability to identify and solve network type problems. | Lectures, practical works, individual | Final exam, assessment of practical works |

| | | | | |
|---|---|---|---|---|
| | | | work, consulting | |
| 6 | Knowledge and understanding of nonlinear programming problems. | Student demonstrates the ability to identify and solve nonlinear programming problems. | Lectures, practical works, individual work, consulting | Final 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** | **6** |
| Know and comprehend concepts and propositions of fundamental mathematical subjects, recognize and apply them solving practical/theoretical tasks | + | + | + | + | + | + |
| Summarize and evaluate critically scientific and professional literature, as well as use various tools for collecting of information for the study process and for solving fixed practical/theoretical problems | + | + | + | + | + | + |
| Identify the problem, collect and analyze real/theoretical data using various mathematical methods, tools and IT technologies | + | | + | + | + | + |
| Think logically and analytically, evaluate alternative ways of task solving and implement optimal solutions | + | | + | + | + | + |
| Work individually and/or in groups by developing and adopting appropriate mathematical models and tools for use in case analysis | + | | + | + | + | |
| Demonstrate awareness of economic, legal, social, ethical and environmental context in mathematical projects | + | | + | + | + | |

**Content**

| No | Content (topics) |
|---|---|
| 1. | Concept of optimization problem. Main types of optimization problems. |
| 2. | Convex sets and functions. |
| 3. | Linear programming. |
| 4. | Graphical solution method of linear programming problem. |
| 5. | Simplex method. |
| 6. | Dual Simplex method. |
| 7. | Transportation problems. |
| 8. | Discrete optimization. |
| 9. | Integer programming. |
| 10. | Network models. |
| 11. | Multicriteria optimization. |
| 12. | Nonlinear programming. |

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

| | |
|---|---|
| **Lectures** | **45 hours** |
| **Practical work** | **30 hours** |
| **Individual students work** | **85 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 work (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 | 2000 | A. Žilinskas. Matematinis programavimas. (Mathematical Programming) | VDU | 83 | 2 | |
| 2 | 2005 | A. Apynis. Optimizavimo metodai. (Optimization Methods) | VU | 0 | 1 | |
| 3 | 2007 | S. Kalanta. Taikomosios optimizacijos pagrindai. (Fundamentals of Applied Optimization) | VGTU | 5 | 1 | http://www.ebooks.vgtu.lt/product/taikomosios-optimizacijos-pagrindai |
| ***Supplementary materials*** | | | | | | |
| 1 | 2007 | H.A. Eiselt, C.L. Sandblom. Linear programming and its applications | Springer | | | |
| 2 | 1995 | D. Bertsekas. Nonlinear programming | Athena Scientific | | | |

**Course programme designed by**

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|---|
| Assoc. prof. dr. Sigita Pečiulytė |