Optimization methods, rationality
and decision making in the social sciences

Language: English
Lecture: (2 hours) x 8
Seminar: (2 hours) x 8

Review
This course aims introducing students to the sphere of applying optimization methods and models in modern economic research.

This course focus on problems:
- classical and modern spheres of application of optimization approaches and operation research in the economy;
- advanced (in comparison to the basic classical approaches) models and methods for solving optimization problems;
- the advantages of optimization approaches to the economic problem;
- objective limitations of the possibilities of optimization concepts in conducting economic research;
- the problems of practical implementation of optimization methods
- modern optimization software.

Some classes include ‘discussion session’ where students should express their opinion on the properties and prospects of the optimization models and methods.

During the semester, students at seminars perform practical tasks (under the guidance of a tutor with possible completion as individual work). These tasks are intended for practical application of optimization methods, which are considered in lectures.

The final task, assuming the application of one of the studied optimization methods for a specific type of problem.

Grade
60% - student’s presentations and activity during the class; 40% - final task.

Basic Literature
Hillier Fr. Introduction to Operations Research (diff. editions).

**Prerequisites**

The default is students have basic knowledge of calculus and simplest methods for solving optimization problems. First of all, the basics of linear programming. However, the basic questions will be partially repeated at the start-up lectures and seminars.

**Course Topics**

**Topic 1:** Operation research, optimization approaches and rationality concepts in modern economic research.


**Topic 2:** Theoretical aspects of linear programming. The duality theory and its economic interpretation.


**Topic 3:** Analysis of the parametric sustainability of the solutions of optimization problems. Parametric programming. Parametric study of linear programming problems.


**Topic 4:** Non-linear optimization problems in the economy and methods for their solution.


**Topic 5:** The problems of discrete optimization in the economy. Methods for solving discrete and integer programming problems.


**Topic 6:** Dynamic programming methods and their economic applications.


**Topic 7:** Relationship between optimization and game-theoretic problems. Economic interpretations.


**Topic 8:** The problems of rational distribution in the economy. Rationing models and Fair Division.