
Subject: Optimization and decision making

Code: CEIE_S1_31

Level of studies: BSc

Semester(s): 3

Teacher: prof. Jarosław Śmieja

Pre-requisite qualification:

Calculus and differential equations, Algebra and analytic geometry, Fundamentals of computer programming. Prior to this course, students should learn how to calculate derivatives, solve linear differential equations, perform calculations using matrix notation and develop simple software given the algorithm.

Course objectives:

Introduction of various types of practical optimization problems and analytical methods for solving them. Development of skills necessary for application of basic numerical algorithms. Introduction of mathematically based decision making in multistage decision processes.

Laboratory exercises aim at teaching how to implement theoretical results and standard algorithms to find solutions of real life optimization problems

Teaching modes and hours (Lecture/Seminar/Class/Project/Laboratory):

30/0/0/0/30

Syllabus description:

Lectures:

- Examples of optimization problems; defining optimality criteria**
- Modeling of decision processes**
- Unconstrained extrema**
- Examples of using necessary conditions**
- Constrained optimization**
- Necessary conditions for constrained minimum**
- Inequality constraints**
- Convex programming**
- Linear programming and simplex algorithm**
- Dynamic programming**
- Zero- and nonzero sum games**
- Decision trees**

Laboratory:

- Analytical methods of solving constrained and unconstrained static optimization problems**
- Optimization of functions of one variable**
- Multivariable optimization**



- Linear programming, simplex method**
- Quadratic programming**

- Direct methods of dynamic optimization, gradient methods**
- Dynamic programming**
- Decision trees/game theory**

References:

- Świerniak, A. Gałuszka, *Optimization Methods and Decision Making. Lecture Notes.* Wyd. Politechniki Śląskiej, Gliwice 2003.
- Z. Ogonowski, J. Smieja, *Optimization Methods and Decision Making. (Handbook for students)* Art&Kolor, Gliwice, 2001. (available for download at <http://www.platforma.polsl.pl/raui/>)

Number of ECTS credits: 5
