Óbudai University **Donát Bánki Faculty of Mechanical and Safety Engineering**	Institute of Mechatronics and Vehicle Engineering

Course name and Neptun-code: Optimization Methods, BMXOPE1MNE   Credits*: 4*
Full time, 1ˢᵗ Semester of the Academic year 2021/22.

Faculties in which the subject is taught: **MSc in Mechatronics**

Supervised by: **Dr. Frigyik Béla András**	Lecturers: **Dr. Frigyik Béla András**

Prerequisites conditions: (Neptun Codes)

Lessons per week:	Theory: **2**	Practice (in Auditorium): **1**	Lab: **0**	Consultation:

Exam type (s,v,f):	**exam**

<div align="center">The Syllabus</div>

Aim: Essentially all engineering problems involve some kind of optimization at some point. The aim of this course is to introduce a couple of common optimization methods: The continuous methods can often help to understand the problem better. While the discrete methods almost always provide us with a practical, albeit sometimes only suboptimal, solution.

<div align="center">Schedule</div>

Weeks	Topics
1.	Local extremum (minimum or maximum). Finding local extremum of functions of one or two variables.
2.	Finding local extremum of function of more than two variables. Convexity and basics of convex optimization.
3.	Conditional optimization. Method of Lagrange multipliers.
4.	Application of method of Lagrange multipliers. Gradient method.
5.	Linear inequalities. Linear programming: Graphical solution.
6.	Linear programming, simplex method.
7.	Integer programming. Branch-and-bound method.
8.	**1st Midterm**
9.	Basics graph theory. Graph algorithms.
10.	Optimal paths. Dijkstra algorithm. Bellman-Ford method.
11.	Maximal matching in bipartite graphs. Hungarian method.
12.	Maximal matching in bipartite graphs with weights. Egerváry's method.
13.	**2nd Midterm**
14.	**Retake**

<div align="center">Requirements</div>

Weeks	Tests
8	1st Midterm
13	2nd Midterm
14	Retake

<div align="center">The evaluation criterias</div>

Classes and tests will be held in person. Any change due to the pandemic situation will be announced in the Moodle course.

All main areas of the course are evaluated by test papers. The course is to be considered successfully completed if and only if both tests are written with mark minimum 2 (50%), as a prerequisite for obtaining a **signature**.

Based on the Study Regulations III.6.(4), the student may receive an **offered grade** if they have written both tests successfully.

All matters which are not covered in this document, the Study and Examination Rules and the provisions of the Study Regulations, valid at Óbuda University, prevails.

<div align="center">The semester closing method (method of examination: written, oral, testing, etc.).</div>

Written exam

Literature:
- Thomas' Calculus, Pearson, 2018
- Ronald L. Rardin, Optimization in Operations Research, Pearson, 2015

Quality Assurance: