IE552 HEURISTIC METHODS FOR OPTIMIZATION (3 0 3) (ECTS:7.5)

Fall 2022 Tentative Course Syllabus

Catalog Description: This course covers applications and developments of heuristic search methods for solving complex optimization problems, detailing various meta-heuristics including genetic algorithms, simulated annealing, and tabu search, and local search algorithms.

Course Objectives: This course aims to introduce types of heuristic methods used to solve complex optimization problems.

On successful completion of this course unit, students/learners will or will be able to:

1. Develop (meta)heuristic search approaches for solving difficult combinatorial optimization problems.

2. Compare the quality of different heuristic approaches

3. Comprehend the basic types of heuristic methods

4. Use metaheuristics including simulated annealing, tabu search, genetic algorithms, ant algorithms and their hybrids

5. Analyze the results of a heuristic method for an engineering problem

Important Notice: This course requires programming in a high level language. It is up to the student which language will be used (e.g., Python, C++, Visual Basic, MATLAB). The students will write codes in the assignments as well as in the project for some heuristics learned throughout the course.

Instructor: Nihal Berktaş, PhD. nberktas@cankaya.edu.tr Office hours TBA

Lecture Time and Place: Friday 18:00-21:00 BALGAT Computer Lab. A-321/322

Textbook: Metaheuristics: From Design to Implementation, El-Ghazali Talbi, Wiley, 2009

Supplementary Material:

Handbook of Metaheuristics, Edited by Glover and Kochenberger, Kluwer Academic Publishers, 2003

Essentials of Metaheuristics, Sean Luke, Lulu, second edition, 2013

Handbook of Metaheuristics, Gendreau, Michel and Jean-Yves Potvin (eds) Springer 2012

Heuristic Search: Theory and Applications, Stefan Edelkamp, Peter Norvig, Elsevier 2011

How to Solve It: Modern Heuristics, Zbigniew Michalewicz, David B. Fogel, Springer 2004

Attendance: Attendance may be taken during class sessions. It is best if you fully attend every hour.

Evaluation:

Assignments: 30%

Project: 30%

Final Exam: 40%

Topics Covered:

1. Introduction
2. Classical Construction Heuristics
3. Classical Improvement Heuristics
4. Simulated Annealing
5. Tabu Search
6. Genetic Algorithms
7. Ant Colony Optimization
8. Particle Swarm Optimization
9. Variable Neighborhood Search
10. Evaluation of heuristic performance
11. Computational complexity of heuristics
12. Lagrangean Relaxation and Lagrangean Heuristics for IP/MIP problems