IE 613 Large Scale Programming

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Class schedule: MMM 567 **Location:** M 1171
Course website: https://moodle.boun.edu.tr
Prerequisites: IE 501 or equivalent (required)
                 IE 611 (recommended)
                 Programming experience (preferably in C++)

Description

This course will cover algorithms and techniques for large-scale computational optimization with an emphasis on mixed-integer programming and implementation issues. The following topics will be covered: search algorithms (branch-and-bound, branch-and-cut, branch-and-price, constraint propagation), quality of relaxation, infeasibility analysis, solver callbacks, decomposition and relaxation methods (Lagrangean, Dantzig-Wolfe, Benders, L-shaped), dynamic column and row generation, parallel computing (Moore's law, Amdahl's law, threads, race conditions, synchronization).

References

"Optimization Theory for Large Systems" Leon S. Lasdon, Dover edition, 2002
 "Linear Programming and Network Flows" Mokhtar S. Bazaraa, John J. Jarvis, Hanif D. Sherali, 4th edition, 2009
"Integer and Combinatorial Optimization" Laurence A. Wolsey, George L. Nemhauser, William, 1999
"IBM ILOG CPLEX Optimization Studio V12.7.1 documentation", IBM, 2017

A number of reading materials will be posted on the course's website. Students are expected to read them **before** the class.

Outline

Week	Date	Topic	Comments
1	18/9	Effective modeling in integer programming, search algorithms	
2	25/9	Preprocessing, cut generation, symmetry breaking	
3	2/10	Infeasibility analysis	
4	9/10	Lagrangean relaxation	
5	16/10	Lagrangean relaxation	
6	23/10	Dantzig-Wolfe decomposition	
7	30/10	Column generation	
8	6/11	Benders decomposition	
9	13/11	Stochastic programming and L-shaped method	
10	20/11	Cutting-plane and dynamic constraint generation	
11	27/11	Callbacks	
12	4/12	Parallel computing	
13	11/12	Constraint programming	Classes end on 15/12

Grading

Homeworks	20%
Project	40%
Final	35%
Class participation	5%