Integer and Combinatorial Optimization
整數與組合最佳化

Instructor: Kwei-Long Huang (黃奎隆)

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Phone: 02-33669508 **Class room**: 國青 233

Class time: 9:10~12:10 AM Thursday

Class website: https://ceiba.ntu.edu.tw/

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Office hours: 11:30~12:30 Monday at 國青大樓 102

Prerequisites:

Linear Programming or Deterministic Models and Methods

Course description:

The course covers fundamental integer programming techniques, including cutting plane methods, branch-and-bound enumeration, Bender's decomposition, Lagrangain relaxation/decomposition, and heuristic/meta-heuristic programming. It also covers special techniques for solving well-known combinatorial problems, such as knapsack problem and the set covering/partition problem. This course will include the following topics:

Tentative outline:

1. Introduction to Integer Programming (IP)
2. IP modeling and applications
3. The beale Tableau
4. Using Linear programming to solve IP problems
5. Cutting plane techniques
6. Branch-and-Bound enumeration
7. Search enumeration
8. Bender's Decomposition
9. Lagrangian Relaxation/Decomposition
10. Heuristic Algorithms
11. Combinatorial problems: knapsack problem and the set covering/partition problem

Course objectives:

The course primarily focuses on study of Integer Programming and gives an overview of classical methods about problem formulations and solving. The goal of this course is to provide students some understanding such as why some problems are difficult to solve, how they can be reformulated to yield better results, and how effective different algorithms can be.

Course requirements:

Your grade in the course will be determined by homework (20%), midterm exam (35%), final exam (30%) and project (15%). The requirements in details are described as follows:

- Homework will be assigned every two weeks and the assignments need to be done independently. Late submissions are not accepted except a prior approval is received from the instructor.
- There are one midterm and one final exam.
- There is a final project which helps students comprehend the class material and apply to practical problems or real cases. The project may consist of a literature review for an application area, a research problem, or a computational study. 2 to 3 students (may vary upon the class size) form a group. Prepare a 25-min presentation and submit a report in the last class

Important dates

April 6:	Study day (no class)
April 20:	Midterm
June 15:	Project presentation
June 22:	Final exam

References:

Text: H.M. Salkin and K. Mathur, *Foundations of Integer Programming*, North-Holland, New York, 1989

D.-S. Chen, R. G. Batson, Y. Dang, *Applied Integer Programming: Modeling and Solution*, Wiley 2010

G.L. Nemhauser and L.A. Wolsey, *Integer and Combinatorial Optimization*, Wiley 1988.

L.A. Wolsey, *Integer Programming*, Wiley 1998.