INTEGER PROGRAMMING

MATH 8460

Course Description:

Advanced study in mathematical programming with integer or mixed integer variables. Topics include integer programming, model creation, developing solution algorithms, and applications of integer programming. **3 credits**

Prerequisites:

MATH 2030 or MATH 2230. Not open to nondegree students.

Overview of Content and Purpose of the Course:

1) Students will become familiar with modern discrete decision making and be able to develop the model and the solution algorithm. In particular, the elementary integer program solution methods, such as the set covering problems, knapsack problems, and their variations.

2) Understand the new concepts of optimality, familiar with modern evolutionary algorithms.

3) Apply the computation ability of modern computers, and hence develop efficient and applicable heuristic algorithm.

Anticipated Audience/Demand:

The course is intended not only for mathematics students, but also for students from any technical area who would like to improve their ability and knowledge in modern decision making.

Major Topics:

1) Creating Integer Programming Models
    a. Model Categories
    b. Formulating IP and MIP Models
    c. Real-World Case Studies

2) Integer Programming Algorithms
    a. Review of Linear Programming
    b. Cutting-Plane Methods
    c. Branch-and-Bound, Branch-and-Cut Methods
    d. Heuristics and Meta-Heuristics: Greedy, GRASP, Genetic Algorithms, Tabu Search

3) Integer Programming Applications
    a. Solving Knapsack Problem
    b. Set Covering Problems
    c. Traveling Salesman Problem
    d. Fixed Charge Problems.

Methods:

The lecture method will be used to initiate the topics discussion.

Student Role:

Students are encouraged to participate in the discussion and/or to ask questions and generally to take as much initiative as possible.

Textbook:

Rader, David J. *Deterministic Operations Research: Models and Methods in Linear Optimization*. Hoboken: John Wiley & Sons, Inc., 2010.

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