Deterministic Models and Methods – Introduction to Optimization

IE 5036 確定型模式與方法

Time: Thursday 14:20 ~ 17:10 (第六、七、八節)

Place: 國青大樓 R233 (we will arrange to use Room 101 after the first week)

Instructor: Prof. Y-C Chou 周雍強

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Description:

This course provides an introduction to optimization. It is designed for developing mathematical sophistication that is required in research work in supply chain management and industrial economics. It covers *deterministic models and methods* that are useful in solving problems of resource configuration, portfolio and mix planning, supply chain control, scenario-based planning, risk management, operation scheduling, and policy design. It is composed of three parts. In the first part, Linear Programming is discussed at a greater depth than in introductory OR courses, with an emphasis on its geometric interpretation. About half of the semester is devoted to equip students with solid knowledge about Linear Programming and its software tools and applications. In the second part, the knowledge on Linear Programming will be extended to Non-linear Programming, Integer Programming, and Stochastic Linear Programming. In the third part, we will discuss dynamic optimization and optimal control and their application to supply chain control and policy design.

This course is suitable for both graduate and upper-level undergraduate students with prior knowledge of introductory Operations Research.

Objectives:

This course has dual objectives. For research-oriented students, this course will further develop their mathematical sophistication for advanced graduate courses. For application-oriented students, this course will provide them with solid knowledge about deterministic models and methods and related software tools. The software tool Lindo/Lingo will be used throughout the course to enhance hands-on experience and skills.

Prerequisite: Introductory Operations Research, Calculus.

References:

(0) Class notes are provided.

(1) *Introduction to Linear Optimization*, by Bertsimas and Tsitsiklis, Athena

Scientific, 1997, Chapter 2 (geometry of LP), 4 (duality), 10 (IP formulation), 11.1 (IP methods).

(2) Linear and Nonlinear Programming, Stephen G. Nash and Ariela Sofer, McGraw-Hill International Edition, 1996, Chapters 4-6.

(3) Introduction to Stochastic Programming, by John R. Birge and F. Louveaux, Springer-Verlag, New York, 1997, Chapters 1,2, 4.1-4.3

(4) Dynamic Optimization, by Alpha C. Chiang, 1992, McGraw-Hill, Chapters 1, 2, 7, 8. Alternatively, Dynamic programming and optimal control, Dimitri P. Bertsekas, 2nd edition, Chapter 3.

Grading:

Homework	Mid-term Exam	Final Exam
40%	30%	30%

Topics:

1. Introduction and Linear Algebra (2 weeks)
2. Linear Programming and Geometric Interpretation (2 weeks)
3. Duality and Sensitivity (2 weeks)
4. Extension to Non-linear Programming (1 week)
5. Integer Programming (2 weeks)
6. Stochastic Linear Programming (2 weeks)
7. Unconstrained optimization (1 week)
8. Dynamic Optimization and Optimal Control (3 weeks)

Course Policy

- Homework assignments are due at the beginning of class. Late homework will not be accepted.
- Quiz scores are combined with homework assignment scores.