

Deterministic Models and Methods for Production System Engineering

546 U6060 確定型模式與方法

Time: Monday 13:20 ~ 16:20 (第五、六、七節)**Place:** 國青大樓 R233**Instructor:** Prof. Y-C Chou 周雍強 and Prof. C-H Wu 吳政鴻

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The globalization trend has brought about vibrant supply, demand and engineering chains of production. These systems are dynamic in their evolution, configuration and operation. In this course, we will discuss mathematical tools for analysis and optimization of production by factory and collaborative enterprise chain. This course will cover linear programming, unconstrained optimization, stochastic linear programming, non-linear programming, integer programming, and dynamic system optimization. We will use example problems in production systems engineering and industrial economics to develop in-depth understanding of the theory.

Objectives:

The objective of this course is to develop mathematical sophistication that is required in research work in production systems engineering and industrial economics. Students will learn how to model problems and optimize solutions in resource configuration, product portfolio planning, competition game, manufacturing strategy, and risk control.

Prerequisite: Operations Research, Calculus, and Linear Algebra.

This course covers materials that are more advanced than what is usually found in introductory operations research courses. Proofs of basic theorems in linear programming will be covered to establish solid foundation for discussing other topics. As a pre-requisite, students are expected to have good grasp of vector spaces.

Textbooks and references:

- (1) *Introduction to Linear Optimization*, by Bertsimas and Tsitsiklis, Athena Scientific, 1997, Chapters 1, 2 (geometry of LP), 4 (duality), 5 (sensitivity), 10 (IP formulation), 11 (IP methods).
- (2) *Introduction to Stochastic Programming*, by John R. Birge and F. Louveaux, Springer-Verlag, New York, 1997, Chapters 1,2, 4.1-4.3
- (3) *Linear and Nonlinear Programming*, by Stephen Nash and Ariela Sofer, McGraw-Hill International Edition, 1996. Chapters 1 and 2 (fundamentals of optimization), and 10 (unconstrained optimization).
- (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 4.

Grading:

Homework	Mid-term Exam 1	Mid-term Exam 2	Final Exam
40%	20%	20%	20%

Topics:

0. Introduction (1 week)
1. Linear algebra (1 week)
2. Linear Programming and Duality (3 weeks)
3. Network flow problems (1 week)
4. Fundamental of optimization (1 week)

(Week 8) First mid-term exam on Nov. 3, 2008: will cover topics 1, 2, 3

5. Non-linear Programming (2 weeks)
6. Dynamic Programming (2 weeks)
7. Integer Programming (1 week)

(Week 15) Second mid-term exam on Dec. 22, 2008: will cover topics 5, 6, 7

8. Unconstrained Optimization (1 week)
9. Stochastic Linear Programming (1 week)
10. Dynamic Optimization (2 weeks)

Final exam: will cover topics 4, 8, 9, and 10

Course Policy

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