Operations Research Applications and Implementation

作業研究應用與實作

Course Syllabus

Time & Place: Tuesday 13:10-17:00 at 儀器設備大樓 IDC Instrument Building 95405
Instructor: 李家岩 博士 Dr. Chia-Yen Lee
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Objective: The objective of this course is to learn the operations research methodologies in manufacturing and information systems. The students will know how to apply operations research techniques to solve the real problems.

Course Content: This course will provide students to learn the methodologies of operations research applied in manufacturing and information systems. We evaluate the performance of manufacturing and service systems and optimize capacity planning and allocation for improving productivity and decision quality. The models include deterministic models (such as linear programming, multi-criteria decision analysis, game theory, etc.) and stochastic models (such as statistical decision theory, stochastic programming, Markov decision process, etc.). The course integrates the knowledge domains of the engineering and management, applied in supply chain, network optimization, health-care and preventive medicine, maintenance reliability, manufacturing scheduling, performance evaluation, vendor selection and order allocation, inventory control, etc. We join the business visits and field survey, and develop the ability of implementation in practice. Finally we should know how to solve the real problem systematically using statistics or optimization methods.

Announcement: Announcements and other information concerning the course will be updated in class or maintained on e-learning website. In addition, it will be used to distribute homework assignments, lectures, and other material as required during the course. Please check this website regularly. Any information posted on it will be as valid as if it was not mentioned in class.

Learning Requirement:
1. Know the techniques of operations research
2. Create theoretical model to solve the problem in real setting
3. Develop the research writing skills and a project report
Grading Policy:
Homework/Midterm Exam 20%
Recitation Session 10%
Literature Review Project 20%
Research Project 50%

Course Policies
Examinations: All exams will be comprehensive up to a specified topic although emphasis will be on the newer material. The formula sheet will be provided in exam. You are allowed to use calculator. There will be no make-up examinations unless prior arrangements have been made with the instructor. An official written authorized excused is required.

Literature Review Project: This is an individual project. The objective of this project is to ask student to develop the research capability in finding the interesting topic with niche and organize the related knowledge so as to solve the real problem. The student should be assigned one specific topic and review the related literature (only 1 paper). Prepare slides and give a presentation (around 15 minutes) and your review comment.

Research Project: This is a team project (no more than 2 students). The objective of the project is to 1) apply the tools you learn from class to solve “real” problem and support decision-making, or 2) Fill the gap in the literature and find the research topic with “niche”. The project should follow the project instruction (delivered to you in class later). Write an analytical research report (word file around 15 pages), prepare slides and give a presentation (around 20 minutes). The report violating the project instruction is not accepted.

Any disagreements or questions regarding any graded material must be discussed within one week after it was returned. No grade will be changed after one week time limit.

Course Outline:
1. Introduction
   1.1 Operations Research and Management Science
   1.2 OR History

Deterministic Model
2. Linear Programming and Goal Programming
   2.1 Scheduling
   2.2 Dynamic Supply Chain Model
   2.3 Capacity Surplus and Shortage Model
   2.4 Network Optimization
3. Multi-Attribute Decision Making (MADA)
   3.1 Feature Selection
   3.2 Performance Evaluation
      3.2.1 Analytic Hierarchy Process (AHP)
      3.2.2 Data Envelopment Analysis (DEA)
4. Multi-Objective Decision Making (MODA)
   4.1 Vendor Selection and Order Allocation (VSOA)
5. Game Theory (if time allows)
   5.1 Nash Equilibrium
   5.2 Variational Inequality
   5.3 Mixed Complimentary Problem

**Stochastic Model**

6. Statistical Decision Theory
   6.1 Inference Diagram and Decision Tree
   6.2 Decision under Perfect Uncertainty
   6.3 Bayesian Theory and Network

7. Stochastic Programming
   7.1 Two-stage Recourse Problem
   7.2 Probabilistic Model
   7.3 Robust Optimization

8. Markov Decision Process (Discrete Stochastic Dynamic Programming)
   8.1 Dynamic Programming
   8.2 Finite-Horizon MDP
   8.3 Stochastic Inventory Theory

**Textbook:** No specific textbook.

**References:**


**Remarks:**

1. Teaching in English 英語授課

2. The students in engineering school and business school are welcome. 工學院與管理學院學生歡迎選修