National Cheng Kung University
Modular Courses 2025 Summer Program

Academic Year：114, Semester：1 Category：Interdisciplinary Integration

線性規劃理論、建模與實作
Linear Programming Theory、Modeling and Practice

Instructor	Affiliation	Graduation (Ph.D.)
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Category	Course Credit	Student Size (Maximum)
Interdisciplinary Integration	1.5	30

Student Background

None

Difficulty

☐ Challenging ■ Moderately Difficult ☐ Medium ☐ Entry Level (Basic)

Format of The Course

Lecture 70%, Practice and Recitation 30%

In each afternoon, there is a practice and recitation section. The TA's will help students with either NEOS computer codes; or homework exercise. There are 5 homeworks in this course.

Grading Policy

- Homework exercise 60%：Each homework counts 12% of the final score (60% for 5 such homework totally)
- Report 40%：The report should be submitted to Moodle system one week after the class ends. It should include two parts: (i) summary of the technical essence taught in class and (ii) your review and thoughts of the class.

Code of Conduct for The Course

None

Course Description

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Linear programming has become an indispensable tool for computer scientists; statisticians; managers; and many others who want to model their problems or applications in a mathematical way. While a comprehensive treatment to the entire theory of linear programming could take up a whole semester having at least three credit hours, in this modular course we intentionally make it relatively concise by focusing more on the modeling aspect with applications. This does not mean that we can completely avoid mathematical theory and proofs. In particular, we feel that it is necessary for students to understand mathematics behind the duality theorem with its proofs. Interesting and practical applications, including the data classification, workshop scheduling, network flows; error code correction; and classical zero-sum games will be covered.

Keywords: Mathematical modeling、Optimization theory、Linear Programming

Timetable and Syllabus

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Period	Timetable	Syllabus
2025/6/23(Mon)	9:00-12:15	Modeling with linear programming. (The Diet Problems; Network Flow problem (maximum flow and minimum cut); Machine Scheduling
	12:15-13:15	Lunch time
	13:15-15:30	Programming and Running linear programming on NEOS. The final 50 minutes will be scheduled to an in-class quiz.
2025/6/24(Tue)	9:00-12:15	Modeling with linear programming. (Data Classification ; Packing Problems; Error Code Correction upper bound estimations)
	12:15-13:15	Lunch time
	13:15-15:30	Programming and Running linear programming on NEOS. The final 50 minutes will be scheduled to an in-class quiz.
2025/6/25(Wed)	9:00-12:15	Farkas Lemma and LP Duality
	12:15-13:15	Lunch time
	13:15-15:30	Recitation and Quiz The final 50 minutes will be scheduled to an in-class quiz.
2025/6/26(Thu)	9:00-12:15	Farkas Lemma and LP Duality
	12:15-13:15	Lunch time
	13:15-15:30	Recitation and Quiz The final 50 minutes will be scheduled to an in-class quiz.
2025/6/27(Fri)	9:00-12:15	Zero-sum game and Nash Equilibrium (Video-taped Section)
	12:15-13:15	Lunch time
	13:15-15:30	Recitation and Quiz The final 50 minutes will be scheduled to an in-class quiz.

Goal of the Course

1. Learn how to formulate real life problems into an optimization mathematical model
2. Be familiar with duality theorem and its proof
3. Study and understand important applications of linear programming

The Importance, Cross-Over Disciplinary and Contemporary of The Curriculum

This is an era of data sciences. Linear Programming is one of the most fundamental mathematical models for the real world applications. Many advanced modeling tools rely more or less on linear programming. Leaning and using linear programming is critical for students to become contemporary and stay competent.

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Remarks

None

本課程若因天災等不可抗力之因素或中央、地方政府公告停課，授課教師需依情況依建議補課方式調整課程進度與補課；若需使用假日、國定假日補課，則需與所有修課學生達成共識方能用例假日補課。

建議補課方式：

1. 線上授課方式補課；
2. 當預期可能會因天災(颱風、超大豪雨...等)宣佈停課時，建議老師先行調整加快課程進度或預先增加可能天氣預警之前幾次課程時數；
3. 停課後隔天起延後下課，補足停課延誤的進度；若停課超過 1 天，則在開始上課後延後下課補課，或當週星期六、日補課；

更改課程授課方式，例如：DEMO 改以考試、報告、作業取代。

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