National Cheng Kung University
Modular Course 2023 Summer Program

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

Instructor	Affiliation	Graduation (Ph.d.)
Sheu, Ruey-Lin	**Department of Mathematics, National Cheng Kung University**	**North Carolina State University（北卡羅來納州立大學）**

Course Type	Course Credit	Class Capacity (Maximum)
Lecture + Recitation	**1.5**	**30**

Student Background

Students from all college are welcome

Difficulty

☐ **Challenging** ■**Medium Well** ☐**Medium** ☐ **Entry Level (Basic)**

Format of The Course

Lecture 70%，Practice and Exam 30%

Note:

1. **In each afternoon, there is a practice and exam section. The TA's will help students with either NEOS computer codes; or homework exercise. The final 50 minutes will be scheduled to an in-class exam. There are 5 such quizzes in this course.**
2. **In case that serious pandemic situation occurs, the course will be changed to an on-line lecture and on-line practice mode.**

Grading Policy

In class exam 50 %，Report 40%，Participation 10%

Note:

Each in-class quiz counts 10% of the final score (50% for 5 such quizzes totally)

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

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

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to understand the duality theorem with proofs. Interesting and practical applications, including the data classification, workshop scheduling, network flows; error code correction; and classical zero-sum games will be covered.

Timetable and Syllabus

Peroid	Timetable	Syllabus
7/3(MON)	9:00-12:15	Modeling with linear programming. (The Diet Problems; Network Flow problem (maximum flow and minimum cut); Machine Scheduling;
	13:15-15:30	Programming and Running linear programming on NEOS. The final 50 minutes will be scheduled to an in-class quiz.
7/4(TUE)	9:00-12:15	Modeling with linear programming. (Data Classification ; Packing Problems; Error Code Correction upper bound estimations)
	13:15-15:30	Programming and Running linear programming on NEOS. The final 50 minutes will be scheduled to an in-class quiz.
7/5(WED)	9:00-12:15	Farkas Lemma and LP Duality
	13:15-15:30	Recitation and Quiz The final 50 minutes will be scheduled to an in-class quiz.
7/6(THU)	9:00-12:15	Farkas Lemma and LP Duality
	13:15-15:30	Recitation and Quiz The final 50 minutes will be scheduled to an in-class quiz.
7/5(FRI)	9:00-12:00	Zero-sum game and Nash Equilibrium (Video-taped Section)
	13:00-15:30	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.

Remarks

None