



2025-2026 Korea University International Winter Campus (KU IWC)

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December 23 (Tue), 2025 - January 9 (Fri), 2026

IWC 510 – Optimization Using Python

I . Instructor

Professor	Bor-Yih Yu
E-mail	boryihyu@ntu.edu.tw
Home Institution	National Taiwan University
Class Time	09:00 – 11:55 AM (KST)
Office Hours	TBA
Class Format	In-person
Academic Field	Engineering

II. Textbook

Required Textbook	None (course materials: handouts)
Recommended Additional Readings	Reference Textbooks: 1. "MATLAB Applications in Chemical Engineering (revised edition)" by Chyi-Tsong Chen (Distributed by National Quimoy University, 2020). 2. "Advanced Engineering Mathematics, 10th Edition" by Erwin Kreysig (John Wiley & Sons, 2011) 3. Chemical Engineering Process Simulation, 1st Edition, 2017, Elsevier.

III. Course Description and Objectives (1 course = 3 credits)

This course, titled "Optimization using Python" aims to explore the use of software to solve general engineering problems.

-In the first half of this course, we will introduce the basic operations of the Python software, including mathematical operations, loops, user-defined functions, differential equation, and optimization.

-In the second half of this course, we will learn how to apply these techniques in solving environmental chemical engineering problems through case studies.

This course can be considered an entry-level course for students who are interested in understanding the application of common software in solving environmental engineering problems. This course welcomes students who do not have a background in engineering or programming. The lecture materials, including the software operation tutorials, will be provided as handouts. Students taking this course do not need to prepare the reference textbooks.

Every 175-minute class will include a 120-minute lecture and a 55-minute discussion. Students taking this course need to participate in every discussion in order to get the grade.

IV. Grading

Midterm Exam	30 Points
Final Exam	30 Points
Assignments	40 Points (Based on in-class discussions)
Total	100 Points

V. Class Outline

Date	Topic	Chapter	Remarks
Dec 23 (Tue)	Basic operation in python	1	
Dec 24 (Wed)	Differential equations	2	
Dec 25 (Thu)	No class		
Dec 26 (Fri)	Optimization	3	
Dec 29 (Mon)	Introduction to neural networks	4	
Dec 30 (Tue)	Statistical analysis	5	
Dec 31 (Wed)	Midterm (in class project)		
Jan 1 (Thu)	No class		
Jan 2 (Fri)	Automation between Aspen Plus and Python	7	
Jan 3 (Sat)	Techno-economic and environmental evaluation in python	8	<i>Make-up class</i>
Jan 5 (Mon)	Case Study (I): Modeling of a bio-chemical reactor	9	
Jan 6 (Tue)	Case Study (II): Modeling of a metal ion capture process	10	
Jan 7 (Wed)	Case Study (III): Modeling of a membrane-based CO ₂ capture process	11	
Jan 8 (Thu)	Case Study (IV): Modeling of a direct air capture process	12	
Jan 9 (Fri)	Final class (in class project)		

VI. Other

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VII. Why Study 'Optimization Using Python'?

There are great advantages to learning optimization techniques using python. The most basic advantage is that the optimization problem can be clearly recognized or formulated and then solved, very reliably and efficiently. These solution methods are reliable enough to be embedded in a computer-aided design or analysis tool, or even a real-time reactive or automatic control system. The main goal of this lecture is to help the students develop a working knowledge of optimization, i.e., to develop the skills and background needed to recognize, formulate, and solve optimization problems using python.