國立台灣科技大學 114學年 第2學期 課程大綱

Spring 2026 NTUST Course Outline

授課教師：高夢瑤

Instructor:Mengyao Gao

課程名稱：反應工程

Course Title：Chemical Reaction Engineering

2026/11/3

課程代號： TE3043301 Course Code	必選修：必修/半學年 Required/Electve:Required/Half Yr.
學分數： 3 Credits	先修課程： Prerequisites
節次教室： Time/Location	F6(IB-512) F7(IB-512) W2(IB-512)
專業核心能力： Core Professional Competencies	運用數學、科學及工程知識的能力 規劃與執行實驗，並具解析數據之能力。 能發掘、分析、應用研究成果及因應複雜且整合性工程問題的能力。
課程網址： Course Website	https://websites.umich.edu/~elements/6e/
課程宗旨： Course Objectives	This course provides students with a comprehensive understanding of chemical reaction engineering, emphasizing both homogeneous and heterogeneous reaction systems. The key objectives include: Chemical Reactor Design and Selection-Examine the principles of reactor design and selection based on reaction type, operating conditions, and industrial applications. Reaction Kinetics and Rate Equations-Develop an understanding of reaction kinetics, rate equations, and their role in reactor performance and optimization. Kinetic Data Acquisition and Analysis-Explore methods for obtaining, analyzing, and interpreting kinetic data to support reactor modeling and design. Reactor Performance Evaluation-Utilize mole balance analysis to assess the efficiency and functionality of various reactor types under different operating modes. Catalytic Reactions and Mechanisms-Introduce fundamental concepts of catalytic reactions, including rate equations and mechanistic pathways. Industrial Applications-Apply chemical reaction engineering principles to real-world industrial processes, addressing challenges related to efficiency, sustainability, and innovation.
課程大綱： Outline of Lectures	

Week Date Syllabus
1-1 2/25 Introduction:
a green reset
1-2 2/27（和平紀念日，放假一天）
2-1 3/4 Mole Balances
2-2 3/6
3-1 3/11 Conversion and Reactor Sizing
3-2 3/13
4-1 3/18 Rate Laws
4-2 3/20
5-1 3/25 Stoichiometry
5-2 3/27
6-1 4/1 Isothermal Reactor Design: Conversion
6-2 4/3
（兒童節、民族掃墓節，放假一天）
7-1 4/8 Isothermal Reactor Design: Molar Flow Rates
7-2 4/10
8-1 4/15 Review
8-2 4/17 Mid-term
9-1 4/22 Collection and Analysis of Rate Data
9-2 4/24
10-1 4/29 Multiple Reactions
10-2 5/1 （勞動節，放假一天）
11-1 5/6 Reaction Mechanisms, Pathways, Bioreactions and Bioreactors
11-2 5/8
12-1 5/13 Catalysis and Catalytic Reactors
12-2 5/15
13-1 5/20 Nonisothermal Reactor Design: The Steady-State Energy Balance
13-2 5/22 Steady-State Nonisothermal Reactor Design: Flow Reactors with Heat Exchange
14-1 5/27 Unsteady-State Nonisothermal Reactor Design
14-2 5/29
15-1 6/3 Diffusion and Reaction in Porous Catalysts
15-2 6/5
16-1 6/10 Final

授課方式： Method of Instruction	講授 Lecture：65% 分組討論 Group discussion：20% 案例研討 Case study：15% 操做練習 Practical exercises：0% 講授 Lecture：Several homework problems, class problems, and an open-ended problem will be tackled in groups of four, with a single grade assigned to each group for each assignment. Most of the problems due on Friday will be worked on collaboratively, with group members assigned by the instructor. As part of fostering cooperative and life-long learning, the exams will also include material from the assigned readings that will not be covered directly in class.%
教科書： Textbooks	Essentials of Chemical Reaction Engineering Paperback – International Edition (2011) H. Scott Fogler (Author)
參考書目： References	1. Chemical Reaction Engineering 3/e Levenspiel (Author) 2.Cooper, J.H., S. Prescott, L. Cook, L. Smith, R. Mueck and J. Cuseo, Cooperative Learning and College Instruction, California State University Foundation, Long Beach, CA, 1990. 3. Goodsell, A., M. Maher and V. Tinto, Collaborative Learning: A Sourcebook for Higher Educahon, National Center on Postsecondary Teaching, Learning, and Assessment, University Park, PA, 1992.
修課須知： Notice	Chemical Reaction Engineering is not just about understanding how reactions happen; it's about applying this knowledge to create solutions that can shape a sustainable future.

評量方式： Grading	The weighting of each of the components will roughly be: Homework & In-Class Work Class & Participation & Engagement 35% - Homework, Class Problems, and ICMs 20% - Comprehensive Problem 5% - Peer & Instructor Evaluations 5% - AI-assisted learning 5% Examinations 65% - Midterm Exam 20% - Quiz 20% - Final Exam 25% Total 100%
備註說明： Notes	(1) Prioritize conceptual understanding. (2) Build a strong foundation early. (3) Practice regularly and strategically. (4) Study collaboratively. (5) Engage actively in learning. Consistent effort, deliberate practice, and intellectual curiosity are the keys to success in this course. Approach your studies systematically, remain proactive, and use every available resource to strengthen your understanding.