화공열및물질전달

Heat and Mass Transfer in Chemical Engineering

Department of Chemical Engineering, Sungkyunkwan University

Instructor: Dr. Seokhyun Choung **Semester:** Fall 2028 **Credits:** 3

Course Description. This course develops a unified understanding of heat and mass transfer phenomena central to chemical engineering design. Students learn to analyze conduction, convection, and radiation in thermal systems, then extend these concepts to molecular and convective mass transfer. Emphasis is placed on solving steady-state and transient problems relevant to heat exchangers, reactors, and separation equipment. The course integrates analytical methods with computational approaches for industrial-scale transport problems.

16-Week Schedule

Week	Topic	Week	Topic
1	Conservation Laws and Modes of Heat Transfer	9	Fick's Laws and Fundamentals of Mass Diffusion
2	Steady-State Conduction and Thermal Resistance Networks	10	Steady-State Molecular Diffusion in Binary Systems
3	Transient Conduction: Lumped Capacitance and Semi-Infinite Solids	11	Transient Diffusion and Mass Transfer Coefficients
4	Forced Convection: Correlations and Boundary Layers	12	Convective Mass Transfer and Heat–Mass Transfer Analogies
5	Natural Convection, Boiling, and Condensation	13	Simultaneous Heat and Mass Transfer
6	Heat Exchanger Design: LMTD and Effectiveness–NTU Methods	14	Mass Transfer Equipment: Packed and Tray Columns
7	Radiation Heat Transfer and View Factors	15	Computational Methods for Transport Problems
8	**Midterm Examination**	16	**Final Examination and Term Paper Due**

Assessment

Component	Weight
Final Examination	30%
Midterm Examination	25%
Problem Sets	20%
Term Paper	15%
Class Participation	10%

References

[1] Welty, Rorrer, Foster. *Fundamentals of Momentum, Heat, and Mass Transfer*, 7th ed. Wiley, 2020.

[2] Deen. *Analysis of Transport Phenomena*, 2nd ed. Oxford, 2011.

[3] Holman. *Heat Transfer*, 10th ed. McGraw-Hill, 2009.