

화공유체역학

Fluid Mechanics for Chemical Engineering

Department of Chemical Engineering, Sungkyunkwan University

Instructor: Dr. Seokhyun Choung

Semester: Spring 2029

Credits: 3

Course Description. This course introduces the principles of fluid mechanics as applied to chemical engineering systems. Students learn to analyze fluid statics, laminar and turbulent flow, pipe networks, and pumping systems through momentum balances and the Navier–Stokes equations. Advanced topics include non-Newtonian fluids, multiphase flow, microfluidics, and an introduction to computational fluid dynamics. Problem sets emphasize engineering estimation and design calculations for chemical process equipment.

16-Week Schedule

Week	Topic	Week	Topic
1	Fluid Properties, Dimensions, and Dimensional Analysis	9	Pumps and Compressors: Selection and System Curves
2	Fluid Statics: Pressure Distribution, Buoyancy, and Manometry	10	External Flow and Boundary Layer Theory
3	Conservation of Mass and the Continuity Equation	11	Non-Newtonian Fluid Mechanics
4	Momentum Balances and the Navier–Stokes Equations	12	Two-Phase and Multiphase Flow
5	Laminar Pipe Flow: Hagen–Poiseuille Equation and Friction Losses	13	Introduction to Microfluidics
6	Turbulent Flow: Reynolds Stress and Friction Factor Correlations	14	Computational Fluid Dynamics Fundamentals
7	Piping Networks, Fittings, and Flow Measurement	15	CFD Case Studies and Applications in Chemical Processes
8	Midterm Examination	16	Final Examination

Assessment

Component	Weight
Final Examination	30%
Midterm Examination	25%
Problem Sets	20%
CFD Mini-Project	15%
Class Participation	10%

References

- [1] Wilkes. *Fluid Mechanics for Chemical Engineers with Microfluidics, CFD, and COMSOL Multiphysics* 5, 3rd ed. Pearson, 2017.
- [2] Bird, Stewart, Lightfoot. *Transport Phenomena*, Rev. 2nd ed. Wiley, 2007.