

457.204 Elementary Fluid Mechanics and Lab.

Instructor: Seo, Il Won (35-310)

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Description:

This course deals with the fundamental theory and equations of fluid motion and mechanics along with the application to the real fluid problems. In the first part of this course, fluid statics and pressure of the fluid at rest are discussed, and then methodologies for the description of the moving fluid are to be introduced. Main part of this course will be focused on the derivations of equations of continuity, energy, and momentum. Practical problems relevant to these equations will also be treated in depth. In the latter part of the course, specific topics and applications in real fluid dynamics and turbulent flow are treated. Similarity laws and theory on the dimensional analysis for fluid experiments are also studied.

Text:

1. Street, R.L., Watters, G.Z., and Vennard, J.K., 1996, Elementary Fluid Mechanics, 7th ed., John Wiley & Sons Inc., New York, N.Y.

Reference:

1. Van Dyke, M., 1982, An Album of Fluid Motion, The Parabolic Press, Stanford, CA.
2. Cimbala, J.M., and Cengel, Y.A., 2008, Essentials of Fluid Mechanics, McGraw-Hill International Edition, Singapore.
3. Fox, R.W., Pritchard, P.J., and McDonald, A.T., 2010, Introduction to Fluid Mechanics, SI Version, 7th ed., John Wiley & Sons Inc., New York, N.Y.

Prerequisites:

Physics, Calculus, Engineering Mathematics

Remarks:

- Student-designed homework: Summary, Problems, Essay
- Close-ended & Open-ended lab. experiments: Student-designed Test

Lecture Contents:

1. Fundamentals: Week 1
2. Fluid Statics: Week 2
3. Kinematics of Fluid Motion: Week 3-4
4. Systems, Control Volumes, Conservation of Mass: Week 5-6
5. Flow of an Incompressible Ideal Fluid: Week 7-8
6. The Impulse Momentum Principle: Week 9-10
7. Flow of a Real Fluid: Week 11-12
8. Similitude and Dimensional Analysis: Week 13-15

Lab. Experiments:

Week	Contents
1-2	Introduction
3-4	Hydrostatic Pressure
5-6	Visualization of the Flow using Laminar Flow Table
7-8	Student-designed Test - Proposal
9-10	Free & Forced Vortices
11-12	Bernoulli's Theorem Experiment
13-15	Student-designed Test - Final

- Technical Tour: Han River Flood Control Office

Grade:

Homework Assignments	20%
Lab. Experiments	20%
Mid-term Exam.	30%
Final Exam.	30%