457.561 Fluid Dynamics

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Description:

This course deals with the physical concepts and fundamental equations of fluid dynamics in the advanced level. In the beginning of this course, the similarity of the fluid transport phenomena and stress-strain relations are discussed. Main part of this course will be focused on three dimensional expressions of equations of continuity and motion for viscous fluids. Then, specific topics and solutions in fluid dynamics are treated. Concept of boundary layer flow is introduced. In the latter part of the course, dynamics of turbulent flow, turbulent boundary layer theory, and turbulence modeling are studied in detail.

Text:

1. Seo, I.W., Lecture Note of Fluid Dynamics, Seoul National University, 2020, Web: **ehlab.snu.ac.kr**

Reference:

1. Daily, J.W. and Harleman, D.R.F., Fluid Dynamics, Addison-Wesley, 1966.

2. Currie, I.G., Fundamental mechanics of Fluids, 3rd Ed., Marcel Dekker, Inc., 2003.

3. Kundu, P.K., Cohen, I.M., and Dowling, D.R., Fluid Mechanics, 5th Ed., Academic Press, 2012.

4. Welty, J.R., Wicks, C.E., and Wilson, R.E., Fundamentals of Momentum, Heat, and mass Transfer, 3rd Ed., John Wiley & Sons, 1984.

5. Tennekes, H. and Lumley, J.L., A First Course in Turbulence, MIT Press, 1972.

6. Hinze, J.O., Turbulence, McGraw-Hill, 1975.

7. Rodi, W., Turbulence Models and Their Applications in Hydraulics, IAHR Monograph, A.A. Balkema, 1993.

Prerequisites:

Elementary Fluid Mechanics and Lab.

Hydraulics and Lab.

Contents:

0. Introduction
1. Fluid Characteristics
2. Kinematics
3. Fluid Transport
4. Continuity, Energy, and Momentum Equations
5. Stress-Strain Relations
6. Equations of Continuity and Motion
7. Boundary Layer Flows
8. Origin of Turbulence
9. Turbulent Boundary Layer Flows
10. Turbulence Models

Grade:

Class Participation	10%
Homework Assignments	20%
Term Project	30%
Final Exam.	40%