457.561 Fluid Dynamics

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Description:

This course deals with the fundamental concepts and fundamental equations of fluid dynamics. In the course, similarity of fluid transport phenomena and stress-strain relations are discussed. Main part of this course will be focused on three dimensional expressions for equations of continuity and motion. In the latter part of the course, specific topics and applications in fluid dynamics are treated. Dynamics of turbulent flow, turbulent boundary layer theory, and turbulence modeling are also studied.

Text:

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

Reference:

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

2. Kundu, P.K. and Cohen, I.M., Fluid Mechanics, 3rd Ed., Elsevier, 2004.

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

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

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

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

Prerequisites:

Elementary Fluid Mechanics

Hydraulics and Lab.

Contents:

1. Fluid Characteristics

2. Kinematics

3. Dynamic Features

4. Continuity, Energy, and Momentum Equations

5. Stress-Strain Relations

6. Equations of Continuity and Motion

7. Some Special Equations

8. Origin of Turbulence

9. Wall Turbulence

10. Turbulence Modeling

Grade:

Homework Assignments	30%
Term Project	30%
Final Exam.	40%