

Fundamental Fluid Mechanics (Fall 2009)

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Outline:

1. Introduction and basic concepts
2. Fluid statics and kinematics
3. Mass, Bernoulli, and energy equations
4. Momentum analysis of flow systems
5. Dimensional analysis and similarity
6. Internal flows
7. Differential analysis of fluid flow
8. Approximate solutions of the Navier-Stokes equations
9. Flow over bodies: drag and lift
10. Selected topics: compressible, turbulent, and micro flows

Homework: Homework sets will be assigned in the class.

Course resource: <ftp://ftp.iam.ntu.edu.tw>

Movies: Titles:

Lagrangian and Eulerian Description of Motion (30 min)
Flow Visualization (31 min)
Pressure Field and Fluid Acceleration (30 min)
Low Reynolds Number Flows (30 min)
Drag (4 parts total 1.5 hr)
Fundamentals of Boundary Layer (24 min)
Boundary Layer Control (25 min)
Vorticity (part 1 and 2 , total about 1 hr)
Secondary Flows (30 min)
Stratified Flows (26 min)
Rotating Flow (29 min)
Flow Instabilities (27 min)

Film Notes: <http://web.mit.edu/hml/ncfmf.html>

Illustrated Experiments in Fluid Mechanics, by National Committee for Fluid Mechanics Film, MIT Press, 1972

Grading Policy: homework (20%), two mid-term exams (50%), final exam (30%)

References:

Yunus A. Çengel and John Cimbala, *Fluid Mechanics: Fundamentals and Applications*, McGraw-Hill, 2006

Frank M. White, *Fluid Mechanics*, 5th Ed., McGraw-Hill, 2003