

ME 509 - Intermediate Fluid Mechanics

Credits: 3

Prerequisite: A first course in fluid mechanics or aerodynamics

Fluid properties. Basic laws for a control volume. Kinematics of fluid flow. Dynamics of frictionless incompressible flow and basic hydrodynamics. Equations of motion for viscous flow, viscous flow applications, boundary layer theory. Wall turbulence, lift and drag of immersed bodies.

Textbook: F.M. White, Viscous Fluid Flow, Third Edition, McGraw-Hill, New York, 2006.

Topics covered:

1. Fluid properties and other preliminary concepts (1 class)
2. Basic laws for a control volume (2 classes)
3. Kinematics of fluid flow (2 classes)
4. Dynamics of frictionless and incompressible flow (3 classes)
5. Basic hydrodynamics and equations of motion of viscous flow (2 classes)
6. Exact solutions of viscous-flow equations and their applications (5 classes)
7. Boundary-layer theory (4 classes)
8. Lift and drag on immersed bodies (4 classes)
9. Incompressible turbulent flows and wall turbulence (4 classes)
10. Exams (3 classes)