

Course	ME 50900 – Intermediate Fluid Mechanics
Type of Course	MSE-ME concentration Undergraduate Elective for ME program
Catalog Description	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.
Credits	3
Contact Hours	3
Prerequisite Courses	ME 31800
Corequisite Courses	None
Prerequisites by Topics	A first course in fluid mechanics or aerodynamics.
Textbook	<i>Viscous Fluid Flow</i> , Frank M. White, Third Edition, McGraw Hill, 2006.
Course Objectives	To review fundamental concepts of fluid mechanics thoroughly and extend them in the first part of the course; to introduce advanced topics and solution techniques in the second part. To strengthen and unify the diligent student’s background in fluid mechanics; and to prepare him/her to read the current literature in fluid mechanics and to pursue advanced studies in the subject.
Course Outcomes	Students who successfully complete this course will have demonstrated an ability to: <ol style="list-style-type: none">1. State basic laws for a control volume in different coordinate systems. (1)2. Derive the kinematics of fluid flow in problem solving. (1)3. Derive the equations for frictionless and incompressible flows. (1)4. Derive the basic equations of motion of viscous flows. (1)5. Find standard exact solutions of viscous-flow equations and apply them. (1)6. Derive and solve basic equations of boundary-layer theory. (1)

7. Find lift and drag forces on immersed bodies with simple shapes. **(1)**
8. Understand concepts of incompressible turbulent flows and wall turbulence. **(1)**

Lecture Topics

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

Computer Usage

Medium

Laboratory Experience

None

Design Experience

Low

Coordinator

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Date

27 June 2018