



Intermediate Fluid Dynamics

MECHENG 6505

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Principles and derivations of fundamental equations for incompressible flows with a special emphasis on formulation of problems.

Prerequisites and Co-requisites:

Prereq: 3503, or Grad standing in MechEng or AeroEng; or permission of instructor.

Course Goals / Objectives:

- Be aware of and understand the basic principles of fluid dynamics
 - Given a physical situation involving fluid dynamics, students should be able to apply essential principles of fluid dynamics
 - Express the essential principles of fluid dynamics mathematically
 - Develop a mathematical and physical model of a given fluid dynamics problem
 - Solve for essential parameters from developed fluid dynamics models
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Course Topics:

- Introduction – Control volumes, reference frames, material derivatives
 - Reynolds transport theorem, kinematics, conservation laws
 - Constitutive equations and Navier-Stokes equations
 - Circulation and vorticity
 - Special forms of governing equations
 - Potential flows, source, sink, and sectors, doublets, Blasius' integral, conformal and Joukowski transformations
 - D'Alembert's paradox
 - Surface waves
 - Couette, Poiseuille flow, Stokes' problems, low-Reynolds number flows
 - Boundary layers
 - Falkner-Skan solutions
 - Momentum integral
 - Introduction to turbulence
 - Reynolds' stresses
 - Algebraic closure models
 - Turbulent channel and pipe flow
 - Turbulent boundary layers
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Designation:

Elective