NOC:Introduction to Boundary Layers - Video course

COURSE OUTLINE

This course introduces the concept of a boundary layer and the physical concepts of boundary layer thickness (δ), displacement thickness (δ*), momentum thickness (θ) and friction drag. It derives Prandtl's Boundary Layer Equations for laminar boundary layers from the basic Navier-Stokes equations and discusses their exact solutions. It discusses how a laminar boundary layer transitions to turbulence and separates. It also discusses thermal boundary layers.

COURSE DETAIL

WeekNo.	Topics
1.	Introduction: Boundary Layer (BL).
2.	BL Parameters (BL thickness, BL Displacement, Momentum Thickness)
3.	BL wall friction and friction drag
4.	Derivation of Prandtl's Laminar BL equations
5.	Application of the Prandtl's BL equations to a flat plate
6.	Similarity solutions to the BL equations (other than flat plate)
7.	Similarity solutions to thermal BL
8.	BL Separation with pressure-gradient
9.	Energy Equation in thermal BL
10.	Prandtl Number and dissipation in thermal BL

References:

Boundary Layer Theory, H. Schlichting, K.Gersten, Springer, 2001

NP-TEL

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http://nptel.ac.in

Mechanical Engineering

Pre-requisites:

Knowledge of Basic Fluid Mechanics

Additional Reading:

1. An Introduction to Fluid Dynamics, G. K. Batchelor, Cambridge University Press, 2010
2. Viscous Fluid Flow, F. M. White, McGraw Hill, USA, 1974
3. Fluid Mechanics, F. M. White, , McGraw Hill, USA, 1979
4. Fundamentals of Aerodynamics, John D. Anderson, , McGraw Hill, USA, 2007
5. Foundations of Aerodynamics, Kuethe and Chow, John Wiley & Sons Inc., 1976

Coordinators:

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