Course Title	Course Code	Credit Hours
Boundary Layer Theory	AE-476	3-0

Textbook:

- Frank M. White, “Viscous Fluid Flow”, McGraw-Hill

Reference books:

- Hermann Schlichting, and Klaus Gersten, “Boundary Layer Theory”, Springer Berlin Heidelberg
- Paul Durbin, “Advanced Approaches in Turbulence”, Elsevier Science

Course Objectives:

This course for aerospace students aims to provide a comprehensive understanding of the boundary layer phenomenon and its critical role in aerodynamic performance. Students will learn the fundamental principles of fluid flow near solid surfaces, including laminar and turbulent boundary layers, flow separation, and the impact of viscosity. The course focuses on analytical and computational methods to solve boundary layer equations for optimizing aerodynamic efficiency in aircraft and spacecraft design.

Course Outline:

- Introduction to Viscous Flow: Concepts of Viscous Flows
- Physical Properties of Fluids In Viscous Motion
- Equations of Laminar Motion with Heat and Mass Transfer: Governing Equations for Laminar Boundary Layers, Heat and Mass Transfer in Laminar Flow
- Flow Instabilities: Types of Instabilities, Linear Stability Theory
- Exact and Approximate Solutions: Analytical Solutions to Boundary Layer Equations, Approximate Methods for Boundary Layer Problems
- Finite-Difference Methods: Numerical Techniques for Boundary Layer Equations, Application of Finite-Difference Methods in Boundary Layer Analysis
- Transition to Turbulence: Stability of Laminar Flows, Mechanisms of Transition from Laminar to Turbulent Flow

- Analysis in Turbulent Flows: Characteristics of Turbulent Boundary Layers, Modeling and Analysis of Turbulent Flows
- Conduction and Convective Heat Transfer: Fundamentals of Heat Transfer in Boundary Layers, Conduction and Convection Mechanisms in Laminar and Turbulent Flows