Course Title	Course Code	Credit Hours
Fundamentals of Compressible Aerodynamics	AE-222	3-0

Textbooks:

- Patrick H. Oosthuizen and William E. Carscallen, “Introduction to Compressible Fluid Flow”, CRC Press

Reference Books/Materials:

- John D. Anderson,“Modern Compressible Flow with Historical Perspective”, McGraw-Hill
- James E. A. John, and Theo G. Keith, “Gas Dynamics,” Pearson Prentice Hall
- Ascher H. Shapiro, “The Dynamics and Thermodynamics of Compressible Fluid Flow”, Wiley
- EASA Part-66 Category B1 Maintenance License Module 11, “Aeroplane Aerodynamics, Structures and Systems”

Course Objectives:

This course aims to introduce students to the fundamental concepts of Compressible gas flow. It covers the governing equations, Thermodynamic principles, and key parameters essential for understanding Compressible flow dynamics.

Course Outline:

- Introduction to Compressible Fluid Flow
- Conservation Laws, Equation of Steady 1-D Compressible Fluid Flow
- Pressure Coefficient, obtaining Lift from Pressure Coefficient, Compressibility Correction, Critical Mach No and Drag Divergence
- Wave Drag and Summary of Airfoil Drag
- Some Fundamental Aspects of Compressible Flow, Wave Propagation and Speed of Sound
- 1-D Isentropic Flow, Normal Shock Waves
- Oblique Shock Waves
- Prandtl Meyer Expansion Fan

- Applications
- Converging Diverging Nozzles Supersonic Airfoils (Lift and Drag Calculation)
- 1D Steady Adiabatic Flow in a Duct with Friction (Fanno Line Flow)
- 1D Steady Flow with Heat Addition or Removal in a Duct (Rayleigh Line Flow)
- Supersonic Diffusers
- Exit Flow for Nozzles and Plug Nozzles
- Aircraft Engine Intakes
- Introduction to Linearized Flow
- Introduction to Methods of Characteristics; Supersonic Rotational Flow; Internal Flow
- Newtonian Flow Theory Boltzmann Equation; Hypersonic Vehicle Design Consideration High Temperature Flows