6th Semester	RME6D002	Compressible Flow and Gas Dynamics	L-T-P 3-0-0	3 Credits

Module I: (9 hours)
Fundamentals of Fluid dynamics and Thermodynamics: continuity equation, Momentum equation, Energy equation of incompressible flow Introduction to compressible flow: Introduction, Isentropic flow in a stream tube, speed of sound, Mach waves; One dimensional Isentropic Flow: Governing equations, stagnation conditions, critical conditions, maximum discharge velocity, isentropic relations

Module II: (9 hours)
Normal Shock Waves: Shock waves, stationary normal shock waves, normal shock wave relations in terms of Mach number; Oblique Shock Waves: Oblique shock wave relations, reflection of oblique shock waves, interaction of oblique shock waves, conical shock waves; Expansion Waves: Prandtl-Meyer flow, reflection and interaction of expansion waves, flow over bodies involving shock and expansion waves

Module III: (9 hours)
Variable Area Flow: Equations for variable area flow, operating characteristics of nozzles, convergent-divergent supersonic diffusers Adiabatic Flow in a Duct with Friction: Flow in a constant area duct, friction factor variations, the Fanno line; Flow with Heat addition or removal: One-dimensional flow in a constant area duct neglecting viscosity, variable area flow with heat addition, one-dimensional constant area flow with both heat exchanger and friction

Module IV: (9 hours)
Generalized Quasi-One-Dimensional Flow: Governing equations and influence coefficients, solution procedure for generalized flow with and without sonic point; Two-Dimensional Compressible Flow: Governing equations, vorticity considerations, the velocity potential, linearized solutions, linearized subsonic flow, linearized supersonic flow, method of characteristics.

Books
1. P. H. Oosthuizen and W. E. Carscallen. Compressible Fluid Flow. NY, McGraw-Hill, 1997.
2. H. W. Liepmann, and A. Roshko, Elements of Gas Dynamics, Dover Pub, 2001.
3. A. H. Shapiro, Compressible Fluid Flow 1 and 2. Hoboken NJ: John Wiley.
4. M. A. Saad, Compressible Fluid Flow. 2nd ed. Upper Saddle River, NJ: Prentice-Hall, 1993.
5. F. M. White, Viscous Fluid Flow. 2nd ed. New York: McGraw-Hill, 1991.

Course Name: Gasdynamics: Fundamentals and Applications
Course Link: https://onlinecourses.nptel.ac.in/noc21_ae03/preview
Course Instructor: Prof. Srisha Rao M V, IISc Banglore