

ME 601 Gas Dynamics (3-0-0-6)

Concepts from thermodynamics; The basic equations of fluid motion; One-dimensional gas dynamics; Isentropic conditions, speed of sound, Mach number, area velocity relations, normal shock relations for a perfect gas, Fanno and Rayleigh flow, one-dimensional wave motion, the shock tube; Waves in supersonic flow: oblique shock waves, supersonic flow over a wedge, Mach lines, piston analogy, supersonic compression by turning, supersonic expansion by turning, the Prandtl-Meyer function, reflection and intersection of oblique shocks, Mach reflection, shock expansion theory, thin aerofoil theory; Flow in ducts and wind tunnels: area relation, nozzle flow, normal shock recovery, effects of second throat, wind tunnel pressure ratio, supersonic wind tunnels; Small perturbation theory; The method of characteristics; Methods of measurement; Computational aspects: One-dimensional inviscid high speed flow.

Textsbooks:

- [1] H. W. Liepmann and A. Roshko, Elements of Gas Dynamics, John Wiley, 1960.
- [2] J. D. Anderson, Modern Compressible Flow, Mc Graw Hill, 1989.
- [3] B. K. Hodge and C. Koenig, Compressible Fluid Dynamics (with P.C. applications), Prentice Hall, 1995.
- [4] A. Shapiro, The Dynamics and Thermodynamics of Compressible Flow, The Ronald Press Co., 1954.