

ME 553 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; Elements of hypersonic flow

References

1. H. W. Liepmann and A. Roshko, *Elements of Gas Dynamics*, John Wiley, 1960.
2. J. D. Anderson, *Modern Compressible Flow*, McGraw Hill, 1989.
3. B. K. Hodge and C. Koenig, *Compressible Fluid Dynamics (with P.C. applications)*, PH, 1995.
4. H. Shapiro, *The Dynamics and Thermodynamics of Compressible Flow*, Ronald Press, 1954.
5. R. D. Zucker and O. Biblarz, *Fundamentals of Gas Dynamics*, Wiley, 2002.