

Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. in Thermal Engg.	Gas Dynamics	MET 522	SM+MT+ET 25+25+50
Semester	Credits	L-T-P	Exam
II	3	3-0-0	3 Hours

Unit - I

Introduction of Gas Dynamics: Introduction and definition of compressible viscous flow; Integral forms of conservation equations – continuity; Momentum and energy equations. **(07 Hours)**

Unit - II

Compressible Flow: Speed of sound and Mach number; Basic equations for one dimensional flows; Isentropic relations; Flow through nozzle and diffusers. Flow with friction – Fanno flow; Flow with heat transfer– Rayleigh flow. **(08 Hours)**

Unit - III

Shock Waves: Normal and oblique shocks and relations; Mach waves; Prandtl–Meyer expansion; Rankine–Hugoniot relation; Application of method of characteristics applied to two dimensional cases; Examples. **(07 Hours)**

Unit - IV

Wind tunnel; Nozzles and One dimensional flow: Design of supersonic wind tunnel and nozzle. Off-design performance of nozzles; Quasi-one dimensional flows; Area-velocity relationship; Isentropic flow through variable area ducts. **(08 Hours)**

Unit -V

Prandtl–Meyer flow: Interaction and intersection of shocks; P-M expansions and boundary layers; Reflection of shocks and Prandtl–Meyer expansion from solid surfaces and fluid surfaces. **(07 Hours)**

Unit - VI

Propulsion systems: Propulsion engines; Air breathing propulsion system; Rocket propulsion system; Supersonic diffusers; Application to simple problems related to propulsion and flow through turbo-machines. **(08 Hours)**

Recommended Books:

1. Fundamentals of Compressible Flow; S. M. Yahya; 3rd Edition; New Age Publishers; 2011.
2. Gas Dynamics; T. Radhakrishnan; 1st Edition; Prentice Hall; 2004.
3. The Dynamics of Compressible Flow; A. F. Shapiro; 1st Edition; The Ronald Press Company 1963.
4. Modern Compressible Flow; J.D. Anderson; 3rd Edition; McGraw Hill; 2004.
5. The Dynamics and Thermodynamics of Compressible Fluid Flow; A. H. Shapiro; Ronald Press Company; 1953.
6. Fundamentals of Gas Dynamics; R. D. Zucker; O. Biblarz; 1st Edition; Wiley and Sons; 2002.