AMAEE15 AERODYNAMICS-II

UNIT-1 ONE DIMENSIONAL COMPRESSIBLE FLOW

1.1 Energy, Momentum, continuity and state equations, velocity of sound, adiabatic steady state flow equations,
1.2 Flow through convergent- divergent passage,
1.3 Performance under various back pressures.

UNIT-2 NORMAL, OBLIQUE SHOCKS

2.1 Prandtl equation and Rankine- Hugonoit relation, Normal shock equations,
2.2 Pitot static tube, corrections for subsonic and supersonic flows,
2.3 Oblique shocks and corresponding equations,
2.4 Hodograph and pressure turning angle, shock polar, flow past wedges and concave corners, strong, weak and detached shocks,

UNIT-3 EXPANSION WAVES, RAYLEIGH AND FANNO FLOW

3.1 Flow past convex corners, Expansion hodograph,
3.2 Reflection and interaction of shocks and expansion, waves.
3.3 Method of Characteristics Two dimensional supersonic nozzle contours.
3.4 Rayleigh and Fanno Flow.

UNIT-4 DIFFERENTIAL EQUATIONS OF MOTION FOR STEADY COMPRESSIBLE FLOWS

4.1 Small perturbation potential theory, solutions for supersonic flows,
4.2 Mach waves and Mach angles, Prandtl-Glauert affine transformation relations for subsonic flows, Linearised two dimensional supersonic flow theory,
4.3 Lift, drag pitching moment and center of pressure of supersonic profiles.

UNIT-5 TRANSONIC FLOW OVER WING

5.1 Lower and upper critical Mach numbers, Lift and drag divergence, shock induced separation,
5.2 Characteristics of swept wings, Effects of thickness,
5.3 Camber and aspect ratio of wings, Transonic area rule.

References Books:

1. Shapiro, A.H., "Dynamics and Thermodynamics of Compressible Fluid Flow", Ronald Press, 1982.
2. Zucrow, M.J. and Anderson, J.D., "Elements of gas dynamics", McGraw-Hill Book Co., New York, 1989.
3. Anderson Jr., D., – "Modern compressible flows", McGraw-Hill Book Co., New York 1999.