AE8503 AERODYNAMICS – II L T P C 3 0 0 3

UNIT I ONE DIMENSIONAL COMPRESSIBLE FLOW 10

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

UNIT II NORMAL AND OBLIQUE SHOCKS 12

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

UNIT III EXPANSION WAVES AND METHOD OF CHARACTERISTICS 8

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

UNIT IV DIFFERENTIAL EQUATIONS OF MOTION FOR STEADY COMPRESSIBLE FLOWS 7

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

UNIT V TRANSONIC FLOW OVER WING 8

Lower and upper critical Mach numbers, Lift and drag, divergence, shock induced separation, Characteristics of swept wings, Effects of thickness, camber and aspect ratio of wings, Transonic area rule. Introduction to Hypersonic Aerodynamics.

TEXT BOOKS:

1. Anderson Jr., D., – “Modern compressible flows”, McGraw-Hill Book Co., New York, 1999.

2. L.J. Clancy, “Aerodynamics” Sterling Book House, 2006

REFERENCES

1. Rathakrishnan, E., “Gas Dynamics”, 6th Edition, Prentice Hall of India, 2017.

2. Shapiro, A.H., “Dynamics and Thermodynamics of Compressible Fluid Flow”, Ronald Press, 1982.

3. Zucrow, M.J. and Anderson, J.D., “Elements of gas dynamics”, McGraw-Hill Book Co.,New York, 1989.