AE 311A Compressible Aerodynamics

Syllabus (2019-20, I Semester)

Instructor: Sanjay Kumar (Phone: ext 6768; E-mail: skmr@iitk.ac.in)

Class timings: Tue (2:30-4 PM), Thursday (4:00 – 5:30PM)

Venue: EEM 117 Lecture Hall

Topics covered:

Review of thermodynamics, Governing equations of compressible flow, Isentropic flow, Area Mach number relation, Speed of sound, Mach cone, Flow regimes in terms of Mach number, Stationary and moving normal shock, Rankine-Hugoniot relations, Oblique shock, Prandtl-Meyer expansion, Reflection, intersection of shocks and expansion waves, Converging-diverging nozzle, supersonic wind tunnel, 1D unsteady flow: Riemann problem, Method of characteristics, Small perturbations applied to, subsonic & supersonic airfoils,slender bodies. Similarity rules and area rule, Curved shock and Croccos Theorem, Shock-Boundary layer interaction, Transonic small perturbation (TSP) equations ,Transonic full potential equations, Rayleigh & Fanno flow, Experimental techniques, Introduction to Hypersonics.

Text/Reference Books:

1. *Text* - Elements of Gas Dynamics. Authors: H.W. Liepmann and A. Roshko
2. The Dynamics and Thermodynamics of Compressible fluid Flow vol. 1: Author: A.S. Shapiro
3. Modern Compressible Flow. 3rd Edition. Author: John D. Anderson
4. Gas Dynamics: E.Rathakrishnan
5. Fundamentals of Gas Dynamics: Zucker and Biblarz (*Recommended*)

Assessment will be based on the following activities

Assessment Activity	**% Weightage**
Mid-Term Exam	30
Quizzes	20
Final Exam	35
Homeworks	5
Attendance	10