AE 3450: Thermodynamics and Compressible Flow

Catalog Description: AE 3450: Thermodynamics and Compressible Flow (3-0-3)
First and Second Law of Thermodynamics for closed and open systems. Isentropic flow. Flows with shocks and expansions. Flows with friction and heat transfer.

Text: At the level of John, Gas Dynamics

Learning Objectives:

1. Introduce the basics of thermodynamics in the form of the First and Second Law and its applications.
2. Familiarize the students with the properties of compressible flow.
3. Introduce limited number of applications of compressible flow.
4. Prepare the student for the analysis of internal and external compressible flows for a variety of applications.

Prerequisites:

1. Calculus based college physics
2. Conservation of energy and momentum
3. Computer programming

Lecture Topics:

1. Introduction of fundamentals (2 hours)
2. First Law for closed and open systems (5 hours)
3. Thermodynamic properties, equations of state (4 hours)
4. Definition of entropy, Second Law of TD and its applications (5 hours)
5. Speed of sound, Mach angle (1 hour)
6. Isentropic flow (3 hours)
7. Normal shocks (7 hours)
8. Oblique shocks (4 hours)
9. Prandtl Meyer Expansions (3 hours)
10. Applications of shocks and expansions (2 hours)
11. Fanno line flow (3 hours)
12. Rayleigh line flow (3 hours)

Midterms (2) (2 hours)

Coordinator: Dr. J. Jagoda, Professor and Associate Chair