



FUNDAMENTALS OF GAS DYNAMICS

PROF. SAMEEN

Department of Mechanical Engineering
IIT Madras

TYPE OF COURSE : Rerun | Core/Elective | UG/PG

COURSE DURATION : 12 weeks (29 Jul'19 - 18 Oct'19)

EXAM DATE : 16 Nov 2019

INTENDED AUDIENCE : Undergraduate students of Mechanical and Aerospace Engineering

PRE-REQUISITES : Thermodynamics and fluid mechanics

INDUSTRIES APPLICABLE TO : Aerospace industry

COURSE OUTLINE

The course introduces compressible flow and its constitutive equations. The physical concepts behind isentropic flows, area-Mach number relation etc will be discussed with practical problems in mind. Properties of shocks and expansions are important parts of this course. All the numerical examples will be in SI units.

ABOUT INSTRUCTOR

Prof. A. Sameen, Department of Aerospace Engineering, IIT-Madras

Research interest: Fluid Mechanics

Current interests: Stability, Transition and Turbulence, Thermal Convection, Quantum Fluids, Magnetohydrodynamics

COURSE PLAN

- Week 1 :** Fluids, compressible flow I & II laws of TD Clausius inequality
- Week 2:** Control volume analysis Conservation of mass Conservation of momentum
- Week 3:** Conservation of energy, Tutorial
- Week 4:** Sonic velocity, Wave propagation, Pressure-energy relation
- Week 5:** Stagnation concept, Isentropic flows, Stagnation relations, Tutorial
- Week 6:** Varying area flow Mass, momentum, energy equations Converging nozzle
- Week 7:** M^* concept, Gas tables, C-D nozzle, Tutorial
- Week 8:** Standing normal shocks, Prandtl's relation, Normal shocks in CD nozzle
- Week 9:** Rankine-Hugoniot equation, Moving shocks, Tutorial
- Week 10:** Oblique Shocks, Theta-Beta-M relation, Shock polar curves
- Week 11:** Expansion fans, Prandtl-Meyer flow, Tutorial
- Week 12:** Concusion