



# FUNDAMENTALS OF COMPRESSIBLE FLOW

## PROF. NIRANJAN SAHOO

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### COURSE OUTLINE :

“Gas Dynamics” is a topic of fundamental interest to Mechanical and Aerospace engineers that provides a link between core subjects i.e. “Fluid Mechanics and Thermodynamics”. It pertains the basic theory of compressible flow, formation of shock waves and expansion waves, nozzle flows. The treatment of the syllabus becomes the backbone of aerodynamic engineers towards research in the design of high-speed vehicles. The contents of the course starts with fluid and thermodynamic fundamentals followed by governing theories of compressible flow phenomena. Many aerodynamic high-speed facilities and their measurement diagnostics governed by these theories, are also covered in this course.

### ABOUT INSTRUCTOR :

Prof. Niranjana Sahoo is affiliated as “Professor” in the Department of Mechanical Engineering, Indian Institute of Technology Guwahati. Having B. Tech Degree in Mechanical Engineering, he has received PhD Degree (in the year 2004) from Department of Aerospace Engineering, Indian Institute of Science Bangalore. Till May 2020, he has 15 years of teaching and research experience at different capacity in Department of Mechanical Engineering, Indian Institute of Technology Guwahati. He has taught several courses at undergraduate and postgraduate level in the area of Fluid and Thermal Engineering, such as Fluid Mechanics, Basic and Applied Thermodynamics, Heat and Mass Transfer, Refrigeration and Air Conditioning, Combustion, Gas Dynamics and Aircraft Propulsion. Besides, he has developed interdisciplinary courses under NPTEL platform, participated in virtual laboratory courses and organized TEQIP Short Term Courses with respect to National mission projects apart from several sponsored research projects. He has more than 100 research publications in peer reviewed journals and conferences. Until date, he has achieved 13 PhD guidance with ongoing research scholars of similar number.

### COURSE PLAN:

**Week-1:** Review Concepts of Fluid Mechanics and Thermodynamics

**Week-2:** Wave Propagation in Compressible Medium

**Week-3:** Quasi-One Dimensional Isentropic Flow

**Week-4:** Normal Shock Waves

**Week-5:** Normal Shock Waves

**Week-6:** Oblique Shocks and Expansion Waves

**Week-7:** Oblique Shocks and Expansion Waves

**Week-8:** Oblique Shocks and Expansion Waves

**Week-9:** Nozzles and Diffusers

**Week-10:** Compressible Flow with Heat Transfer and Friction

**Week-11:** Measurement Diagnostics and Experimental Facilities for Compressible Flow

**Week-12:** Measurement Diagnostics and Experimental Facilities for Compressible Flow