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Computational Gas Dynamics

Instructor

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Email:

Department: Aerospace Engineering

Course Time:

Lecture venue:

Detailed Course Page:

Announcements

Brief description of the course

This course was introduced with the aim of providing a CFD course to the doctoral and masters students, focusing on numerical methods for compressible flows. Apart from the basics of finite difference and finite volume methods of discretization, various numerical methods including the central schemes and upwind schemes are taught, together with information on latest CFD algorithms.

Prerequisites

1. A course on Partial Differential Equations, with emphasis on Hyperbolic PDEs

2. A course on Fluid Dynamics

3. A course on Gas Dynamics

Syllabus

Governing equations of compressible fluid flows, classification of partial differential equations, analysis of hyperbolic conservation laws, basics of discretization, finite difference and finite volume methods, numerical diffusion, numerical methods for scalar and vector conservation laws, central and upwind discretization methods, flux splitting methods, Riemann solvers, Kinetic (Boltzmann) schemes, relaxation schemes.

Course outcomes

The students would learn the basic discretization methods for the partial differential equations of Gas

Dynamics, together with the modern and latest CFD algorithms for simulating compressible fluid flows.

Grading policy

50% for assignments and mid-term tests and 50% for final examination.

Assignments

Resources

1. Laney, B., Computational Gas Dynamics.

2. Toro, E.F., Riemann Solvers and Numerical Methods for Fluid Dynamics.

3. Godlewski, E. and Raviart, P., Numerical Approximation of Hyperbolic System of Conservation Laws.