

ME 683 Computational Gas Dynamics (3-0-0-6)

Review of PDEs and their classification--Conservation laws--Concepts of characteristics--Riemann problem for linear equations--Concept of finite volume methods--Conservation, consistency and stability--Upwind methods--Godunov scheme--High resolution schemes--TVD and limiting--Euler equations--Approximate Riemann solvers--Temporal discretisation--Boundary conditions--Convergence acceleration techniques--Unsteady flows--Introduction to unstructured grids.

Textbooks/References:

- [1] R.J.LeVeque, Numerical methods for conservation laws, Second edition, Birkhauser, 1992.
- [2] R.J. LeVeque, Finite volume methods for hyperbolic problems, Cambridge University Press, 2002.
- [3] C.B. Laney, Computational Gas Dynamics, Cambridge University Press, 1998.
- [4] J. Blazek, Computational Fluid Dynamics: Principles and Applications, Second edition, Elsevier, 2005.
- [5] Doyle Knight, Elements of Numerical Methods for Compressible Flows, Cambridge University Press, 2006.
- [6] C. Hirsch, Numerical Computation of Internal and External Flows: Fundamentals of Computational Fluid Dynamics, Vol.1, 2nd Edition, Butterworth-Heinemann, 2007.