

distinguished speakers series

The Department of Mechanical and Materials Engineering presents:

Dr. Aleksandar Jemcov

Department of Aerospace and Mechanical Engineering, University of Notre Dame, Indiana, USA

All Mach Number Fractional Step Solver for High Fidelity Turbulent Flow Simulations

Modern high-fidelity simulations (LES, DNS, VLES) of compressible flows require highly efficient numerical schemes. Given the fact that high-fidelity simulations are invariably transient, highly efficient numerical schemes, from the memory usage and floating point operations point of view, require a new efficient numerical algorithms. One such approach is extension of the fractional step algorithms widely used in high-fidelity incompressible simulations. Incompressible fractional step algorithms are based on Helmholtz-Hodge theorem that separates solenoidal from irrotational part of the flow field leading to Chorin's projection method. While there is no unique decomposition for compressible flows, it is possible to use a similar, non-unique, decomposition for compressible flow fields to obtain highly efficient numerical algorithms. In this presentation we demonstrate one such algorithm and show its preconditioning properties as well as its numerical efficiency. The algorithm is implemented using the open source numerical library Caelus. Examples of computations spanning DNS, LES and VLES are used to illustrate the efficiency of the



FRIDAY, MAY 27th - 11:00 ^{a.m.} McLAUGHLIN HALL ROOM 312