

**Computer Project 1: Explicit Compressible Euler Solver**  
**Handed out October 25, 2025; Due by November 11, 2025**

Write a computer program to solve the compressible Euler equations using explicit, finite-volume techniques. You are required to test your code on the circular-arc bump geometry which was provided to you for the following three free-stream conditions:

- $M_\infty = 0.4$
- $M_\infty = 0.8$
- $M_\infty = 1.4$

For all cases consider the gas to be air and at a free-stream pressure of  $p_\infty = 0.01\text{atm}$  and  $T_\infty = 300 \text{ K}$ . Assume air as an ideal gas for your calculations. You can time march the equations to a steady-state using local time stepping. You can use a first order explicit time integration scheme to advance your solution.

- Your code should construct the flux at the interfaces using AUSM scheme and Roe scheme.
- Your output should include contour plots (**colour lines**) of Mach number, velocity vector plots or stream line plots, convergence histories (log scale) and anything else that helps in analysing the flow field.

You need to present your report in a technical paper format. Please use the same format as discussed for Project-1.