Potential Flow Analysis by MATLAB (a)

[Project 1a] Flow over a Circular Cylinder (Nonlifting flow)

Using the MATLAB, develop your own code (simple Text User Interface only, no Graphic User Interface development required) to analyze a potential flow over a circular cylinder (nonlifting flow over a circular cylinder).

Task 1): Consider a potential flow over a circular cylinder of radius $R$ (superposition of doublet and uniform flow). Recommended: let radius $R = 1$ for simplification. Plot streamline pattern of the flow field (including the stagnation streamline. You must choose proper “equal length” scale plot, so that the results have no distortions on flow field or circular cylinder. You should have a plot, which is exactly identical to the figure of B-3 note (page 10).

Task 2): Consider, once again, a potential flow over a circular cylinder of radius $R$. Plot the pressure coefficient ($C_p$) on the surface of the cylinder (plot $C_p$ distribution for both upper & lower surfaces in a single figure). Use a non-dimensional coordinate parameter $x/R$ ($-1 < x/R < 1$) for the $x$-coordinate of your plot. NOTE): The standard convention of $C_p$ plot is “opposed vertical axis” (negative up positive down: you must “invert” the vertical axis on MATLAB figure).

General Instructions for the Aerodynamics Group Assignment

1. This is a group assignment (minimum 2 / maximum 3 students: absolutely no exception).
2. Develop an original MATLAB code.
3. Copying the code between groups is considered “cheating” (zero score).
4. Obtaining external help (students who took AE301 in the past, etc.) is “cheating” (zero score).
5. The instructor is happy to answer your questions, but will never de-bug your code.

Required Submittals

1. Short write-up (not a full-length report), including:
   - Cover Page (with all group member’s names & signatures)
   - Result 1 (MATLAB generated plot: streamline pattern plot)
   - Result 2 (MATLAB generated plot: pressure coefficient distribution plot)
   - Complete list of your MATLAB code

2. Original MATLAB code (must be in a single executable .m file) sent to the instructor via email (on or before specified due date).

Due

Right after the completion of unit B-3. Actual date will be announced in class and posted on-line (course homepage).

- This is (half of) the first AE301 course project (project 1a). There are total two course projects planned (project 1a/1b & 2a/2b).
- All team members receive the exact same score.
- Forming and maintaining the project teams are 100% all your (student’s) responsibility: the instructor will not be responsible to form group(s) and take care of your group’s leadership, nor group’s time and work sharing, internal conflict resolution, etc.