MECH 427 – AIRCRAFT DESIGN

WITH DR. GOUSHCHA

HOMEWORK #5

Date Due: 2020 November 20ᵗʰ at 11:00am

You will need to **short report and attach your MATLAB code**. The word document should include comprehensive explanation of your calculation steps, including all formulas, constants, and conversion factors you used.

Consider the following propeller:

1) Blades are constructed from an airfoil whose C_l and C_d values can be found in the reference uploaded with this homework in Figure 3. You may want to digitize each plot to automate the process.
2) Airfoils are placed at 45° angle of attack ($\theta = 45^o$)
3) The shaft rotational speed is $6,000\ rpm$ (convert to rad/s)
4) Chord of the airfoils is $2cm$
5) Free stream speed of the airplane is $7m/s$

Choose a $1\ cm$ wide ($dr = 1cm$) section of the propeller which is located $3cm$ ($r = 3cm$) from the hub.

Perform **BY HAND** first **THREE** iterations to find a using the procedure outlined in class. Once you have the three iterations by hand, code the rest of the iterations in MATLAB to converge a. Assume $b = 0$.