

# Introduction to Scientific Computing Lab 4

## Files and Tecplot

### 2017

## 1 Objectives

After completing these exercises you will be able to:

- Handle input and output using files
- Write to Tecplot format and using Tecplot

## 2 Notes

**Work individually.**

Create a directory for each week so you can come back to your codes in the future. Create files for each of the different exercises and name them in a logical manner, so `exercise1.c` for example.

When changing the source code, ensure you have **saved it before compiling** otherwise the compiler will only see the old file

When you have completed all exercises, ask a demonstrator to assess your work. They will test your code and ensure it is formatted well with good commenting, structure and variable names. This is a useful feedback mechanism, so listen to what the demonstrator has to say and their recommendations for improving your code.

In case of an error, read the compiler error. This will often tell you the line (or close to the line) where the error is occurring. Fix it, test and repeat for the errors you have. If you are getting nowhere then it can often be useful to copy the error into google, or use some keyword searches. If you are really stuck on one error then call over an assistant who will be able to point you in the right direction.

### 3 Exercises

When an aerofoil is placed in flow (as shown in figure 1), pressure forces, that act normal to the surface, can be measured at any given point. In this exercise you will read in aerofoil pressure distributions from files and write these into Tecplot formatted files. You will then visualise the pressure distributions in Tecplot and output a figure of the data.

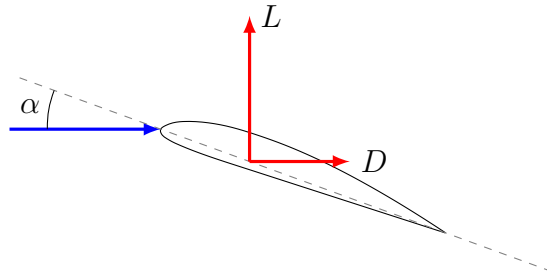


Figure 1: Aerofoil forces

Ensure you create a new directory for this week. From blackboard, download the three files required for this week's exercises. In the files, column 1 is the  $x$  location on the aerofoil and column 2 is  $C_p$ . the data is formatted so that the pressure distributions work anti-clockwise around the aerofoil.

1. Write a program that reads in the pressure distributions for:

- $0^\circ$  (this is stored in the file `naca23015_00degs.txt`);
- $5^\circ$  (this is stored in the file `naca23015_05degs.txt`);
- $10^\circ$  (this is stored in the file `naca23015_10degs.txt`).

Output the  $x$  and  $C_p$  values to the screen to ensure you are reading the file in correctly

**NOTE:** the files are not the same length so consider how this will affect which type of loop you use to read in the file

2. Extend exercise 2 to have your program output a Tecplot formatted file containing three different zones (one for each angle of attack) where each zone is the  $x$  locations and  $C_p$  values

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3. Import your file into Tecplot, investigate Tecplot's settings and output a well formatted jpeg figure to display the pressure distributions all on one plot. **Save your layout file.** Ensure your plot adheres to the following requirements:

- Plot  $C_p$  negative upwards
- Create a suitable scale
- Add gridlines
- Use different colours/shades and different line types to ensure the lines are distinguishable when printed in black and white
- Include a line legend
- An example is shown below

