

---

# Aeroelasticity

## Lecture 3: Matlab Session - Flutter

G. Dimitriadis

---

# Matlab tutorial example

- Set up the quasi-steady equations of motion for a pitching and plunging 2D flat plate.
- Plot the variation of the natural frequencies and damping ratios of your system with airspeed.
- Write a code to determine the flutter speed.
- Plot the variation of flutter speed with pitch stiffness

---

# Parameter values

- You can choose your own system parameters or use the following:
  - $c=0.25\text{m}$ ,  $x_f/c=0.4$ , material=aluminium, plate thickness=0.02m
  - Uncoupled, undamped frequencies:
    - Plunge= 2Hz
    - Pitch=8Hz
  - Air density:  $\rho=1.225 \text{ Kg/m}^3$ .

---

# Challenge

- If you finish the tutorial example and have time to spare:
- Repeat everything using unsteady aerodynamics.
- Compare the quasi-steady to the unsteady flutter predictions.