ASSIGNMENT 3 — MUSCLE MODELLING

For all questions below, provide all programming code and plots in the report.

1. Plot the following (should look the same as in lecture). 5 marks (undergrad) | 7 marks (graduate)
   a. Activation Dynamics. 1 mark
   b. Active Force Length Curve. 1 mark
   c. Passive Force Length Curve. 1 mark
   d. Force (x-axis)-Velocity Curve. 1 mark
   e. Tendon Strain-Force Relationship. 1 mark
   f. Tendon Compliance — define equation **(Graduates Only)**. 1 mark
   g. Velocity (x-axis)-Force Curve — rearrange equation **(Graduates Only)**. 1 mark
   h. Note: You can also refer to Thelen (2003) for the equations, albeit with a slight change in some of the notation

2. Program the Hill-Model presented in Class. 10 marks
   a. Replicate the slide (10): Hill Models | Max Stim. Use the same initial conditions as listed on the slide. Plot STIM, γ, Tendon Force, Muscle Fiber Length, and Tendon Length. 10 marks
   b. Use any integration scheme you prefer, but you may have to go quite small with Euler (e.g., 0.00001 s)

3. Use the given DMA model code by Zahalak (1981) (**Graduates Only**). 6 marks
   a. Replicate the slide (29): Zahalak (1981) | Constant Velocity; using the same initial conditions as listed on the slide. 2 marks
   b. Also plot normalized Q_0, Q_2 in addition to Q_1. 1 mark
   c. Replicate the slide (31): Zahalak (1981) | Oscillating Muscle; using the same initial conditions as listed on the slide. 2 marks
   d. Also plot normalized Q_0, Q_2 in addition to Q_1. 1 mark