# Homework 2

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## I. Results

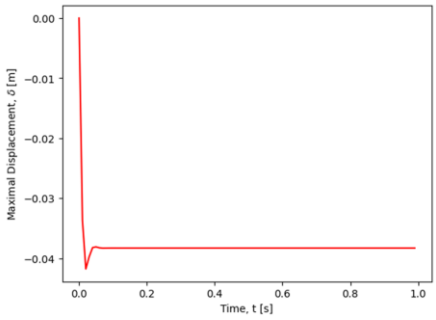


Figure 1: Shown is the maximal displacement of the beam over time.

The maximal displacement does go to steady state, and the theoretical maximal displacement is -0.038 m, and the simulation result is -0.0383 m. They are close to each other with about 0.8% error. The following is the calculation of theoretical maximal displacement.

$$y_{max} = \frac{Pc(l^2 - c^2)^{1.5}}{9\sqrt{3}EIl}$$

$$= \frac{-2000 \times 0.25 \times (1^2 - 0.25^2)^{1.5}}{9\sqrt{3} \times \left(70 \times 10^9 \times \frac{\pi}{4}(0.013^4 - 0.011^4)\right) \times 1}$$

$$= -0.038\, m \quad (1)$$

## II. Discussion

The theoretical maximal displacement is linear to the external force, but the actual maximal displacement is non-linear. In other words, it can only handle small displacement with small force.

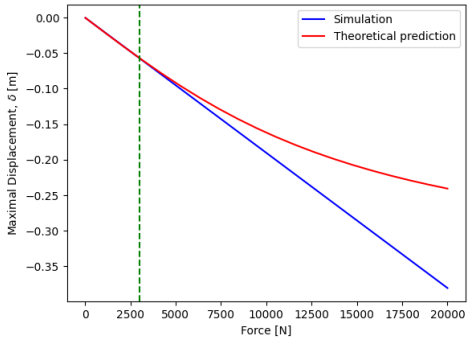


Figure 2: Shown is the simulation and theoretical maximal displacement over force.

Fig. 2 shows after the external force is larger than 3000 N, the simulation and beam theory values start to diverge.