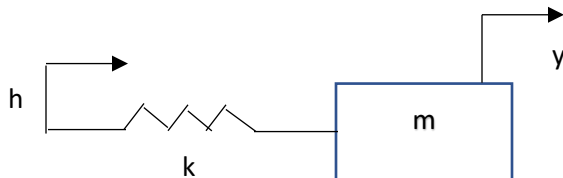


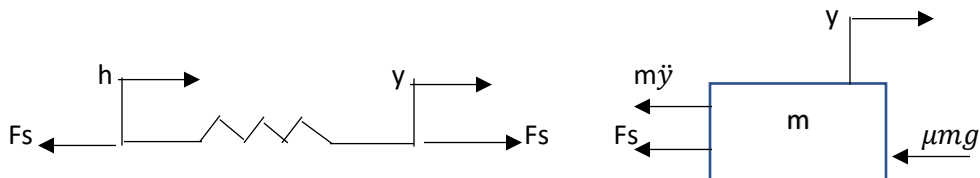
Horizontal spring mass and friction problem:

A horizontal mass is attached to a spring as shown below. The ground has a friction coefficient of μ . Plot the position of mass with respect to time using functions and Simulink. Compare both solutions through a single graph. Input u is a step input of magnitude 0.1. Assume other constants as:

$m=400\text{kg}$; $g=9.81$; $\text{spring constant}(k)=1.4\text{e}5$; $\text{friction coefficient}(\mu)=0.2$



Free body diagram:



Equation from free-body-diagram:

$$F_s = k(y - h)$$

$$m\ddot{y} + F_s + \mu mg * \text{sign}(\dot{y}) = 0$$

Equations in state variable format:

$$y = x1; \quad \dot{y} = x2$$

$$\dot{x1} = x2$$

$$\dot{x2} = -\frac{1}{m} * (F_s - \mu mg * \text{sign}(\dot{y}))$$