**ME 190 Lab 4 – Matlab and Simulink**

**Learning Objectives:** By the end of the lab, you should be able to:

* Derive equations of motion for a translating mechanical system
* Create a Simulink model and use it to simulate the motion of a translating mechanical system
* Integrate the equations of motion explicitly in Matlab

**Exercises and What to Submit**

**Submit a report that documents your modeling. The first section of your submission must be a Summary of what you did, how you did it, and what you learned. Don’t forget your name and date in the published report.**

--------------------------------------------------------------------------------------------------------------------  
**Exercise 1) Derive the equations of motion** --------------------------------------------------------------------------------------------------------------------

1. Derive the equations of motion for the translating mechanical system shown below. Derivation by hand is fine, but also explore the capability within Matlab for symbolic mathematics. Do your solutions agree?

k

c

M

x

y

--------------------------------------------------------------------------------------------------------------------  
**Exercise 2) Simulate the motion of the system using Simulink**--------------------------------------------------------------------------------------------------------------------

For your simulation, let:

k = 1000 N/m

M = 10 kg

c = 100 N-s/m

x0 = 0 m

xdot0 = 0 m/s

y = 0. 01 m \* u(t) ( u(t) is the unit step function )

**Exercise 3) Simulate the motion of the system in Matlab by integrating the equations of motion**--------------------------------------------------------------------------------------------------------------------

For your simulation, let:

k = 1000 N/m

M = 10 kg

c = 100 N-s/m

x0 = 0 m

xdot0 = 0 m/s

y = 0. 01 m \* u(t) ( u(t) is the unit step function )

**References**

* <http://ctms.engin.umich.edu/CTMS/index.php?example=Suspension&section=SimulinkModeling>