

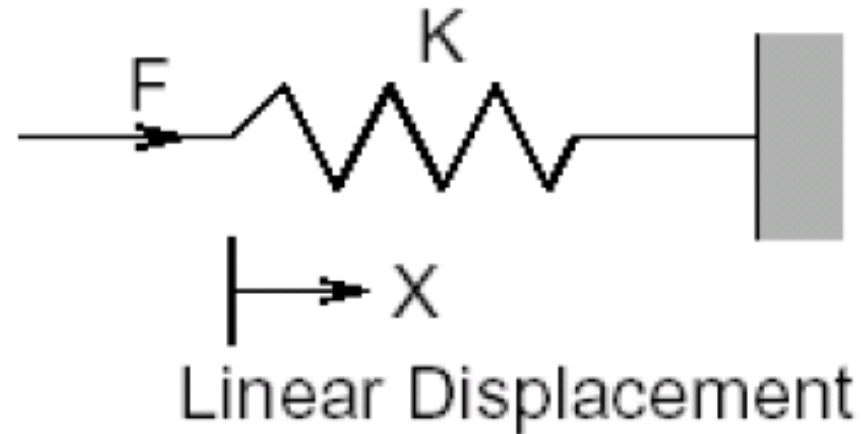
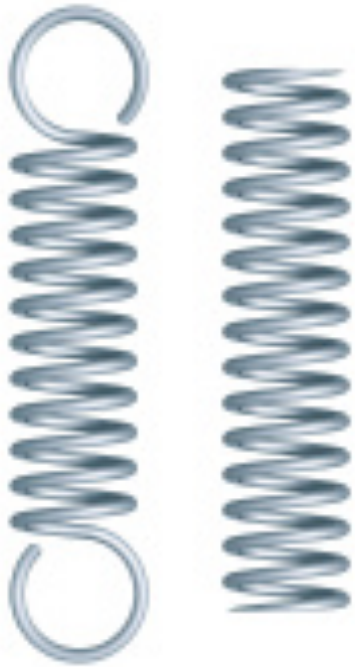
ROCO222: Intro to sensors and actuators

Lecture 3

Some simple Newtonian mechanics

Compression & extension springs

Resists with opposing force proportional to extension of movement



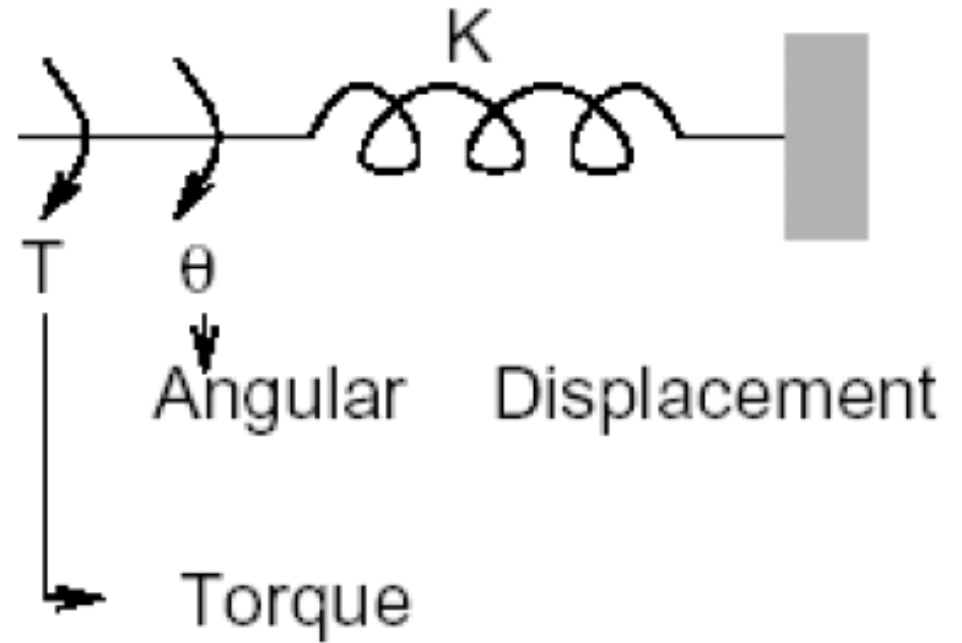
$$f = kx$$

where

f is force in N

k is the spring constant in N/m

Torsional springs



$$T = k\theta$$

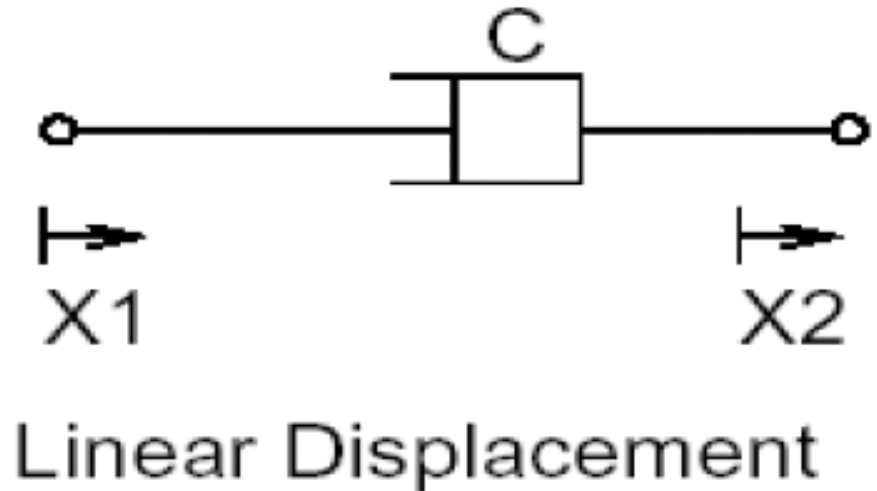
where

T is torque in Nm

k is the spring constant in Nm/rad

Dampers and dashpots

Resists with opposing force proportional to velocity of movement



$$f = C \frac{dx}{dt}$$

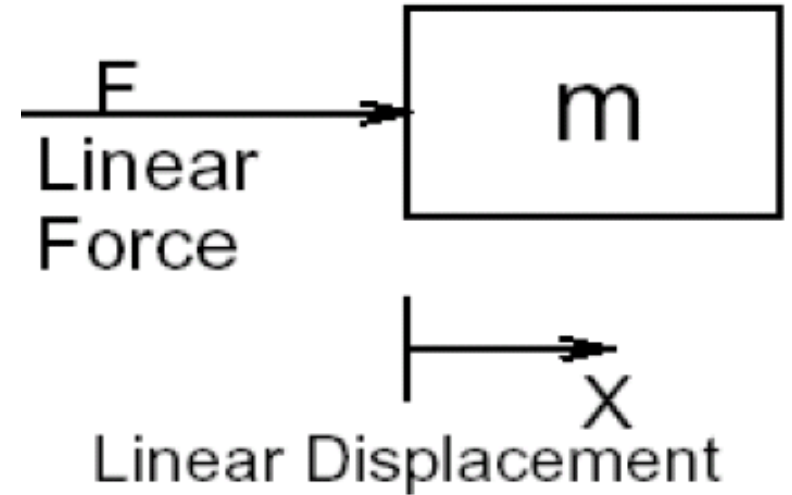
Where

f is force in N

C is viscosity in Ns/m

Inertial Mass

Resists with opposing force proportional to acceleration of movement



Where

f is force in N

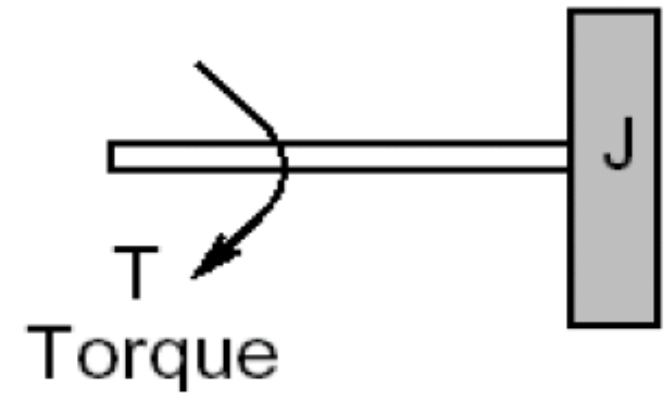
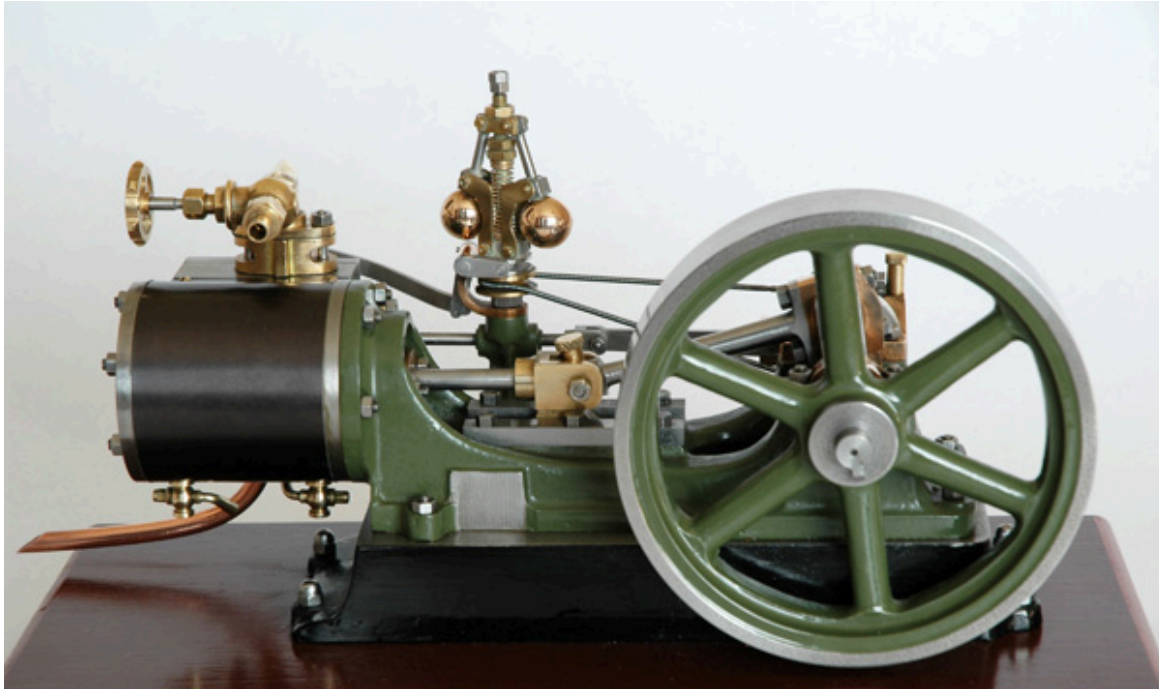
m is mass in Kg

a is linear acceleration in m/s^2

$$f = m \frac{d^2 x}{dt^2} = ma$$

Moment of Inertia

Resists with opposing torque proportional to angular acceleration



Where

T is torque in Nm

J is moment of inertial in Kgm²

$$T = J \frac{d^2\theta}{dt^2}$$