# Module 4 - Spring Systems

ME3050 - Dynamics Modeling and Controls

Mechanical Engineering

Tennessee Technological University

## Topic 3 - The Mass Spring Model

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- Motivation
- The Mass-Spring Model
- Newton's Approach
- Example: Automotive Suspension

# Motivation

- Autombile Suspesnsion
- Internal Combustion Engine
- Clocks
- so many more ....

Images: Wikipedia

# The Mass-Spring Model

First, consider the physical problem and list all simplifying assumptions necessary or desired. In general, the designed should start simple and add complexity incrementally.

Model Assumptions:

1.
2.
3.

Images: T. Hill

# Newton's Approach

## Newton's Second Law Approach

1. Draw a Free Body Diagram
2. Make an assumption of motion
3. Determine all forces acting on the system and their directions.
4. Write Newton's second law for the appropriate DOF.
5. Re-write the ODE in the standard form of a system equation.

# Newton's Approach

This results in a fundamental equation of motion that will use throughout the rest of the semester.

# Example: Automotive Suspension

# Example: Automotive Suspension - Steps 1,2 and 3

# Example: Automotive Suspension - Steps 4,5