ME 3050 Lecture - Dynamics Review - Lecture 1

- **The dynamics are represented as ordinary differential equations called the _____ of _____.**

- **Deriving the _____ of _____ is typically done in one of two ways.**

  1. Newtonian Approach - Vector Based Method
     - Translational
     - Rotational
  2. Conservation of Energy Approach - Energy Based Method
     - Kinetic Energy
     - Potential Energy

- **Example:** DJI Phantom with 3-axis Camera Gimbal - Whoa!!!

- **Simpler Example:** Quarter Car Suspension Model

  - **<u>Problem Statement</u> - Derive the equations of motion using (1) Newton's approach and validate using the (2) Conservation of Energy.**

  - **<u>Assumptions</u> - List the assumptions used in the modeling process.**

– **Figure(s) - Draw a free body diagram (FBD) and/or a sketch of the system. Some problems will require more than one. You need at least one per degree of freedom .**

– **Newton's Approach**

1. Draw a Free Body Diagram

2. Determine all forces acting on the system and their directions.

3. Write Newton's second law for the appropriate DOF.

4. Re-write the ODE in the standard form of a system equation.

– **Conservation of Energy Approach**

1. Draw a Free Body Diagram

2. Determine all energies present in the system and their type.

3. Write Conservation of Energy for system. Call this *equation 1*.

4. Take the derivative of *equation 1* with respect to time. Set this equal to zero and call this *equation 2*.

5. Re-write the ODE in the standard form of a system equation.