

Steps for Modeling Mechanical Systems (using Newtonian Methods)

- 0) Model the system with components (masses, inertias, dampers, springs, etc.) and forces
 - a. Determine inputs and outputs
- 1) Determine the Degrees of Freedom (DOF) and System Order
- 2) Assign coordinates for every DOF (indicating positive directions)
- 3) Assign any necessary constitutive coordinate systems
 - a. Write down the constitutive coordinate equation
- 4) Free Body Diagram (FBD) ALWAYS!!!!
 - a. Write down constitutive force equations
- 5) Apply Newton's 2nd Law Equations using the sign convention assigned in step #2
 - a. $\vec{\uparrow} \sum F = ma$
 - b. $\curvearrowright \sum M = I\alpha$
- 6) Repeat Steps #3 and #5 as necessary
- 7) Simplify to get 1 Equation of Motion (EOM, i.e. Differential Equation) per DOF
- 8) Solve (if necessary)