**ENGR 4580 Motor and Actuator Specification Worksheet**

**Team Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

This worksheet is to help organize your calculations for each actuator (motor, linear actuator, lead screw, cylinder, etc.) your system will use, so you can determine the right ones to buy. Actuators are spec’d based on speed and torque or force. Multiplying these variables together yields power.

Information on motor specification is available on D2L (Content > Design > Motor Spec) and on this [Motor Specification](https://youtu.be/59wQfvEBH9w) YouTube video. Dynamics review on Newtonian kinetics [theory](https://youtu.be/HlnZId4va60) and [procedure](https://youtu.be/4LV7VtIB9os) are available at the embedded links.

You need one calculation per actuator. This worksheet is set up for 3 actuators, but add more as needed.

# Procedure:

1. *State assumptions:* Describe what type of actuator this is, how it is positioned (horizontal/vertical plane), and what load it will drive.
*Example:* “The drive wheel motors turn in the vertical plane to propel the vehicle. We must consider the 20 kg vehicle weight, friction, and 5 kg payload, along with our desired speed of 2 m/s and 3 s startup time. The final answer will be divided by two to find torque for each wheel, because there are two drive wheels.”
2. *Draw free body diagram*: include all forces and torques acting on the actuator, from inertial, dissipative, gravitational, or other external forces.
3. *Assign a coordinate frame*: specify which direction of motion is positive.
4. *Write the formulas*: you can derive these from the FBD as learned in physics and dynamics courses, or plug into the motor spec equation provided.
5. *Solve the equations*. Plug in the actual numbers to get an answer. The most efficient way is to put them in an Excel spreadsheet or Matlab so you can easily change variables and recalculate if design parameters change. Do a team reality check on the answer to judge if it seems reasonable.

# Actuator 1: Actuator type, Subsystem, Student Name

1. Assumptions:
2. Free body diagram and
3. Coordinate frame
4. Formula and equation derivation
5. Solution and reality check

# Actuator 2: Actuator type, Subsystem, Student Name

1. Assumptions:
2. Free body diagram and
3. Coordinate frame
4. Formula and equation derivation
5. Solution and reality check

# Actuator 3: Actuator type, Subsystem, Student Name

1. Assumptions:
2. Free body diagram and
3. Coordinate frame
4. Formula and equation derivation
5. Solution and reality check