**MPTC**

**Force & Circular Motion**

**Procedure**

* **Warning!** This is one of the few mechanics experiments that can seriously injure you. Keep your hands and loose clothing well away from the quickly rotating cage.
* We will determine the force required to stretch a spring of unknown force constant.

**Method :**

* Record the number of grams stamped into the mass. The manufacturer does not quote an error estimate. What is probably the error in this quantity?
* Measure the distance from the center of rotation (marked by a small line on one side of the cage) to the center of the mass (marked by a line around the cylindrical mass) when the spring is extended just enough to trip the indicator. Record an error estimate. You may find that it easier to measure this length while the cage is attached to the table during method 2.
* Attach the cage to the motor and increase the speed of rotation until the indicator trips. Make sure the speed is as low as possible while still tripping the indicator.
* Record the number of revolutions on the counting wheel before engaging the gears. One partner should use the stopwatch to time 30 seconds during which time the other partner should engage the gears of the counting wheel. Record the final number of revolutions and subtract from the initial count. Record a timing error estimate. Remember that just because the stopwatch display has two decimal places does not mean that the timing error is 0.01 seconds.
* From these data, determine the force (in newtons) required to trip the indicator. Include an error estimate. (Do **not** get a numerical value for the speed, and do not solve for the error in the speed. You want a formula for the force in terms of only the quantities that you measure in lab and speed is not one of them.)

**Analysis :**

Assume that the equilibrium position of the spring is at the center of rotation. What is the spring constant of the spring in MKS units? No error estimate is required here.

Identify at least two sources of statistical error.

Identify at least two sources of systematic error.