Lab 6: Induction

1 Assignment

In this lab, your team will be investigating induction. There is a magnet attached to the CNC that can be moved to pass by the mounted coil. This will induce an EMF (electromotive force, $\mathcal{E}$) in the coil that can be measured with the DAQ. Your team is tasked to:

1. calculate the magnetic flux from induced EMF data
2. determine how the induced EMF depends on the velocity of the magnet with respect to the coil

2 Deliverables

For your lab report, 10% of the grade will be for following the guidelines in the lab report template. Another 10% will be allocated for the Abstract and Introduction of your report. The remaining percentage will be based on your inclusion of:

1. *[15%]* a plot showing the EMF as a function of time for *one* of the data runs you collected. This run should be at the same velocity as the data you used to create the plot for Deliverable 2
2. *[20%]* a plot from *one* of your data runs (i.e., just for a single velocity) showing the integrated flux through the coil as a function of time
3. *[15%]* a description of the process your team used to calculate the magnetic flux for a given data run
4. *[30%]* a plot showing how the maximum induced EMF ($\mathcal{E}_{max}$) varies as a function of the magnet's velocity (v).

3 Technical Information

3.1 Performing a sweep

To aid in data collection for this lab, you may use the `run_induction_sweep.py` script in the `examples/scanning` directory. This script will move the CNC and read from the DAQ simultaneously, based on some different parameters and variables in the code. It will produce a plot on screen of the collected data and write it out to a .csv file.

By default, the script will take one pass and record the output. To collect data more efficiently, you are encouraged to make some modifications to this code.

4 Hazard Assessment

- This lab uses strong neodymium magnets. Use caution with these magnets and ferromagnetic materials around these magnets, as they will attract strongly and can easily pinch fingers or break.