In the previous problems you explored the magnetic field and its effect on moving charges. You also saw how magnetic fields could be created by electric currents. This lab will carry that investigation one step further, determining how changing magnetic fields can give rise to electric currents. This is the effect that allows the generation of electricity, which powers much of the world’s activities.

The problems in this laboratory will explore different aspects of changing the magnetic flux through a coil of wire to produce an electric current. You will investigate the current produced in a coil of wire by moving the coil, moving the magnet causing the magnetic field, changing the area of the coil perpendicular to the magnetic field, and changing the magnetic field.

### Objectives:

After successfully completing this laboratory, you should be able to:

• Explain what conditions are necessary for a magnetic field to produce an electric current.

• Determine the direction of a current induced by a magnetic field.

• Use the concept of magnetic flux to determine the electric effects of a changing magnetic field.

• Use Faraday's law to determine the magnitude of a potential difference across a wire produced by a change of magnetic flux.

Preparation:

Read Sternheim & Kane Chapter 20.1 & 20.3.

**Before coming to lab you should be able to:**

• Use a DMM to measure current, potential difference, and resistance.

• Sketch the magnetic fields from permanent magnets and current carrying coils of wire.

• Use vector addition to combine magnetic fields from several sources.

**•** Use the right-hand rule to determine the direction of the magnetic fields from circuit loops and wires.

• Use a Hall probe to determine the strength of a magnetic field.

• Use the definition of magnetic flux.