Lecture 29: Faraday's Law

Lenz's Law

Current is induced in a loop of wire when the magnetic flux through the loop changes.
The direction of the induced current is such that the induced magnetic field opposes the change in flux.

$$\Phi = A_{eff}B = AB\cos\theta$$

Changes in flux:

- B changes (increases/decreases)
- Loop changes area or angle
- Loop moves in or out of magnetic field

Faraday's Law

An emf is induced in a conducting loop if the magnetic flux through the loop changes.
If the flux changes by Δϕ during time Δt, the magnitude of the emf is

$$\varepsilon = \left|\frac{\Delta\phi}{\Delta t}\right|$$

$$\Phi = A_{eff}B = AB\cos\theta$$

If N turns in coil:

$$\varepsilon = N\left|\frac{\Delta\phi}{\Delta t}\right|$$

Examples