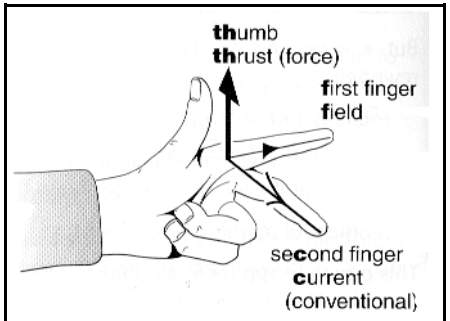
# Chapter 15 Electromagnetic Machines

$$\varepsilon = -\frac{d(\Phi N)}{dt}$$

Electromagnetic Induction

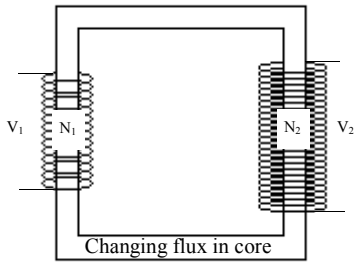
- In a **simple electrical motor,** a **commutator** keeps the current direction in the coil the same so the turning effect is always in the same direction **.**
- A **generator** involves a coil being rotated within a magnetic field. This induces a current in the wires. The current is alternating because the coil is always changing direction within the magnetic field.
- The induced EMF is increased by :
  - moving the magnet faster
  - there are more turns on the coil
  - a magnet giving a stronger field is used




Flemming's left Hand Rule

**Lenz's law**: if an induced current flows, its direction is always such thet it will oppose the change in flux which is produced

Transformers




$$\frac{V_2}{V_1} = \frac{N_1}{N_2}$$

Power input = Power output

$$V_1 I_1 = V_2 I_2$$

$$F = B\,I\,l$$

Length of current carrying conductor

force exerted upon a current in a magnetic field

$$\text{Flux density } B = \frac{\Phi}{A}$$

Tesla (T)

Area

Magnetic Flux

$$\Phi = \Lambda N I$$

No of turns

Current

permeance of the magnetic circuit