$$V = IR \tag{1}$$

$$\boxed{R = \frac{\rho L}{A}} \tag{2}$$

$$\rho \tag{3}$$

$$H \cdot dl = NI \tag{1}$$

where

$$dl = l_c$$

$$B = \mu_0 \mu_r H \tag{2}$$

where $\mu_0 = 4\pi \times 10^{-7}$ and $\mu_r = 1.05$ for air.
For steel, μ_r is in the range of 2000 to 6000.

$$\frac{B}{\mu_0 \mu_r} = H \tag{3}$$

$$\frac{B}{\mu_0 \mu_r} \cdot l_c = NI \qquad (4)$$

$$B = \frac{\Phi}{A_c} \qquad (5)$$

$$\frac{\Phi}{\mu_0 \mu_r A_c} \cdot l_c = NI \qquad (6)$$

where

$$\frac{l_c}{\mu_0 \mu_r A_c} = R_{\text{rel}}$$

$$\Phi R_{\text{rel}} = NI \qquad (7)$$

$$NI = \Phi R_{\text{rel}} \qquad (7)$$

$$NI = \Phi R_{\mathrm{rel}}$$

where

$$NI = \text{Magnetomotive Force (MMF)},$$
$$\Phi = \text{Flux},$$
$$R_{\mathrm{rel}} = \text{Reluctance of the Magnetic Circuit}.$$