# Magnetic field of a finite length solenoid

$$B = \frac{1}{2} \mu_0 n I \left(\frac{l}{\sqrt{l^2 + r^2}}\right)$$

*Where:* $\mu_0$ = *magnetic permeability*

$n$ = *number of turns*

$I$ = *current*

$l$ = *length of the solenoid*

$r$ = *radius of the solenoid*

# Magnetic field of a multi-layered finite length solenoid

$$\sum_{i=1}^{m} B_m = \frac{1}{2} \mu_0 n I \left(\frac{l}{\sqrt{l^2 + r_m^2}}\right)$$

*Where: The sum of the magnetic fields of all the layers gives the total magnetic field*

# Magnetic force of a solenoid

$$F = I L \times B$$

*Where : I* = *current*

$L$ = *length of the solenoid*

$B$ = *magnetic field*