ELEC 344
3rd Tutorial – Additional Slides

The unit of permeability

September 26, 2016

Wonbae Choi

The University of British Columbia

The unit of permeability

As we learned, the permeability has the following relationship between Flux density (B) and Field Intensity (H)

Then, let's derive the unit of permeability.

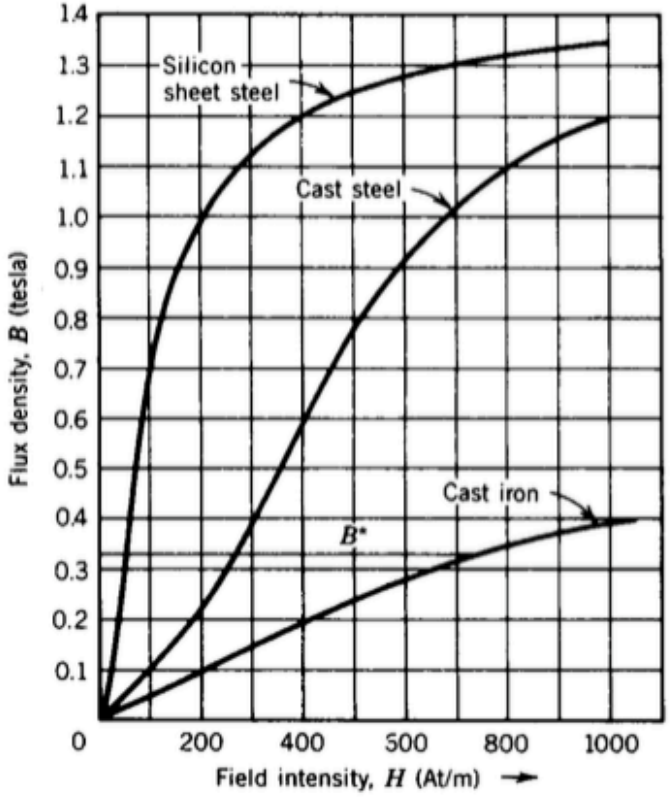

FIGURE 1.7 Magnetization curves.

$$\mu = \frac{B}{H}$$

The unit of permeability – Continued

a) The unit of Flux Density (B) is Tesla. As an SI derived unit, tesla can also be expressed as

$$T = \frac{V \cdot s}{m^2} = \boxed{\frac{N}{A \cdot m}} = \frac{J}{A \cdot m^2} = \boxed{\frac{H \cdot A}{m^2}} = \frac{Wb}{m^2} = \frac{kg}{A \cdot s^2}$$

b) The unit of magnetic field intensity (H) is expressed as below

$$\frac{A}{m}$$

c) Then following equations are derived easily;

$$\mu = \frac{B}{H} = \left[\frac{T}{\frac{A}{m}}\right] = \left[\frac{\frac{N}{A \cdot m}}{\frac{A}{m}}\right] = \left[\frac{N}{A^2}\right]$$

$$\mu = \frac{B}{H} = \left[\frac{T}{\frac{A}{m}}\right] = \left[\frac{\frac{H \cdot A}{m^2}}{\frac{A}{m}}\right] = \left[\frac{H}{m}\right]$$

The unit of permeability – Continued

Therefore, we can see that the unit [N/Am] is equivalent to [H/m].

You can use either [N/Am] or [H/m]; however, as the standard SI unit is [H/m], we recommend you to use [H/m] throughout the course.