Chapter-9

(Hysteresis loss & Eddy Current loss)

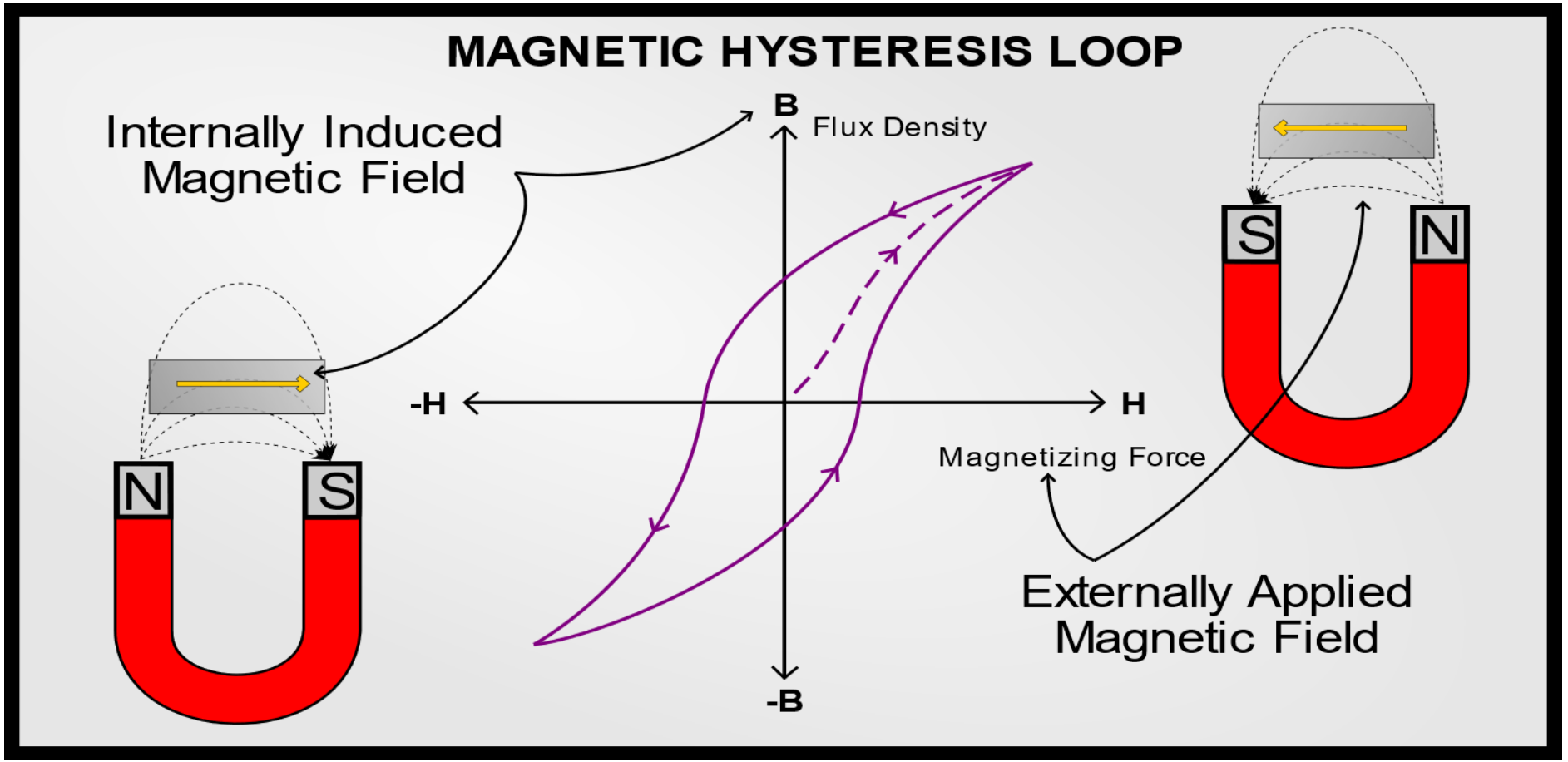
Lecture-1

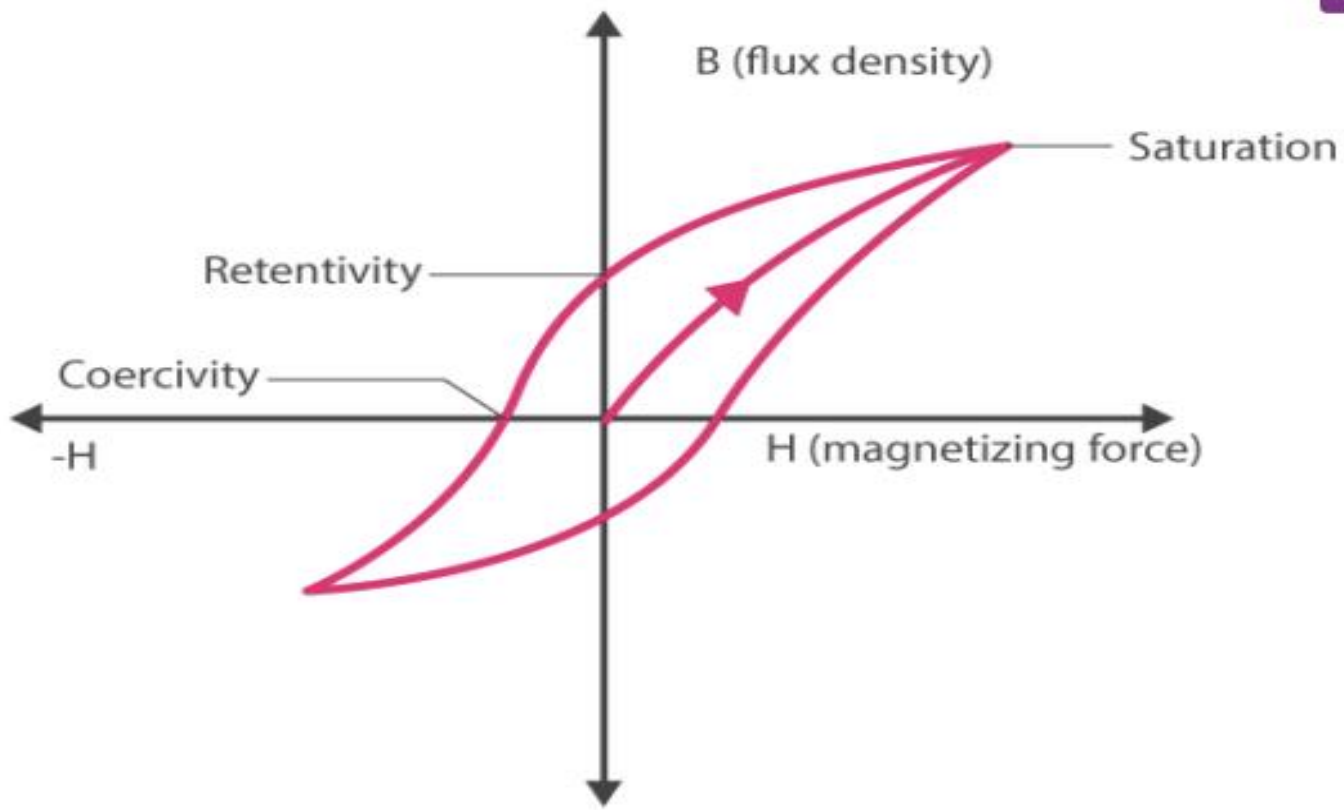
What are Hysteresis loss?

- Hysteresis loss is caused by the magnetization and demagnetization of the core as current flows in the forward and reverse directions. As the magnetizing force (current) increases, the magnetic flux increases. But when the magnetizing force (current) is decreased, the magnetic flux doesn’t decrease at the same rate, but less gradually. Therefore, when the magnetizing force reaches zero, the flux density still has a positive value. In order for the flux density to reach zero, the magnetizing force must be applied in the negative direction.

- The equation for hysteresis loss is given as:

- $P_b = \eta * B_{max}^n * f * V$
- P_b = hysteresis loss (W)
- η = Steinmetz hysteresis coefficient, depending on material (J/m3)
- B_{max} = maximum flux density (Wb/m2)
- n = Steinmetz exponent, ranges from 1.5 to 2.5, depending on material
- f = frequency of magnetic reversals per second (Hz)
- V = volume of magnetic material (m3)


MAGNETIC HYSTERESIS LOOP
Internally Induced
Magnetic Field
B
Flux Density
-H
H
-B
N
S
S
N
Magnetizing Force
Externally Applied
Magnetic Field


B (flux density)
Saturation
Retentivity
Coercivity
-H
H (magnetizing force)