Physics 112

Wednesday Dec 6th

Springs & Elastics

Hooke's Law

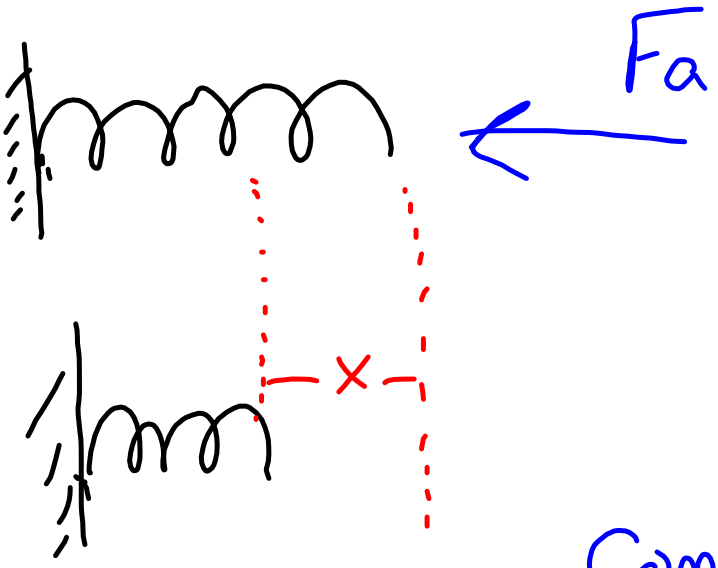
$$F = kx$$

F = Force applied to a spring or an elastic (N)

k = spring constant of the spring or the elastic. (N/m)

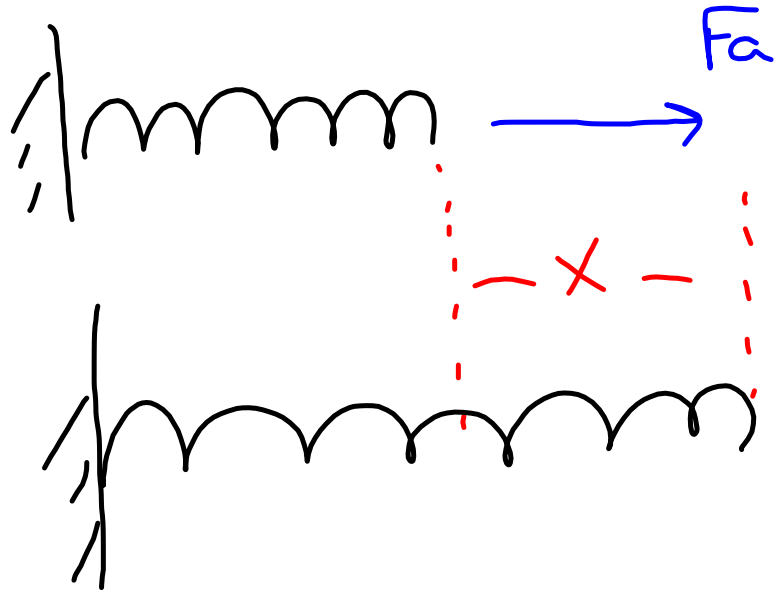
x = Extension or compression of the spring or elastic once the force acts on it (m)

Spring



Compression

Extension



$k \rightarrow$ Spring Constant N/m

- Basically is a measure of how strong or how weak the spring or elastic is.

- Stronger k ↑
- Weaker k ↓

Example:

$k = 250\ N/m$

It would take a force of 250 N to stretch or compress the spring/elastic 1.0 m

$k = 33\ N/m$

It would take a force of 33 N to stretch or compress the spring/elastic 1.0 m

Example:

What force is required to compress a spring with a spring constant of 100.0 N/m, 8 cm?

$$F = kx$$

$$F = 100.0\,N/m\,(0.08\,m)$$

$$F = 8.0\,N$$

Potential Energy of a Spring or an elastic.

$$E_e = \frac{1}{2} k x^2$$

E_e → Elastic potential energy of the spring.
→ Measured in Joules

k → Spring constant (N/m)

x → Extension or Compression. (m)

E_e → Stored energy (potential) that the spring has when it is compressed or extended. It is called stored as the energy will be released once the force is removed that is compressing or extending the spring.

$$\Delta E_e = E_{e_2} - E_{e_1}$$

After the force is applied.

Usually 0 J as this is the E_e before the force is applied. ($x = 0$ m)

Efficiency

Efficiency is the ratio of useful energy or work output to the total energy or work input.

$$\text{eff} = \frac{W_o}{W_I} \times 100\% \qquad \text{eff} = \frac{E_o}{E_I} \times 100\%$$

Green Text

$F = kx$

$E_e = \frac{1}{2}kx^2$

p 258 (35, 36, 37)

p 261 (38, 39, 40)

p 276-277 (30-37)