Chapter 8- Reminder

1- The general definition of the Potential Energy is: $\Delta U = -W = -\int_{x_i}^{x_f} F(x)\,dx$

2- The Gravitational Potential Energy (Optional Reference Ground): $U_g = m\,g\,h$

3- The Elastic Potential Energy: $U_s = \frac{1}{2} k\,x^2$

4- The Mechanical Energy: $E_{Mec.} = K + U_g$

5- Conservation of Mechanical Energy (<u>only for conservative force</u>): $\Delta E_{Mec.} = \Delta K + \Delta U_g = 0$, or $K_1 + U_{g_1} = K_2 + U_{g_2}$

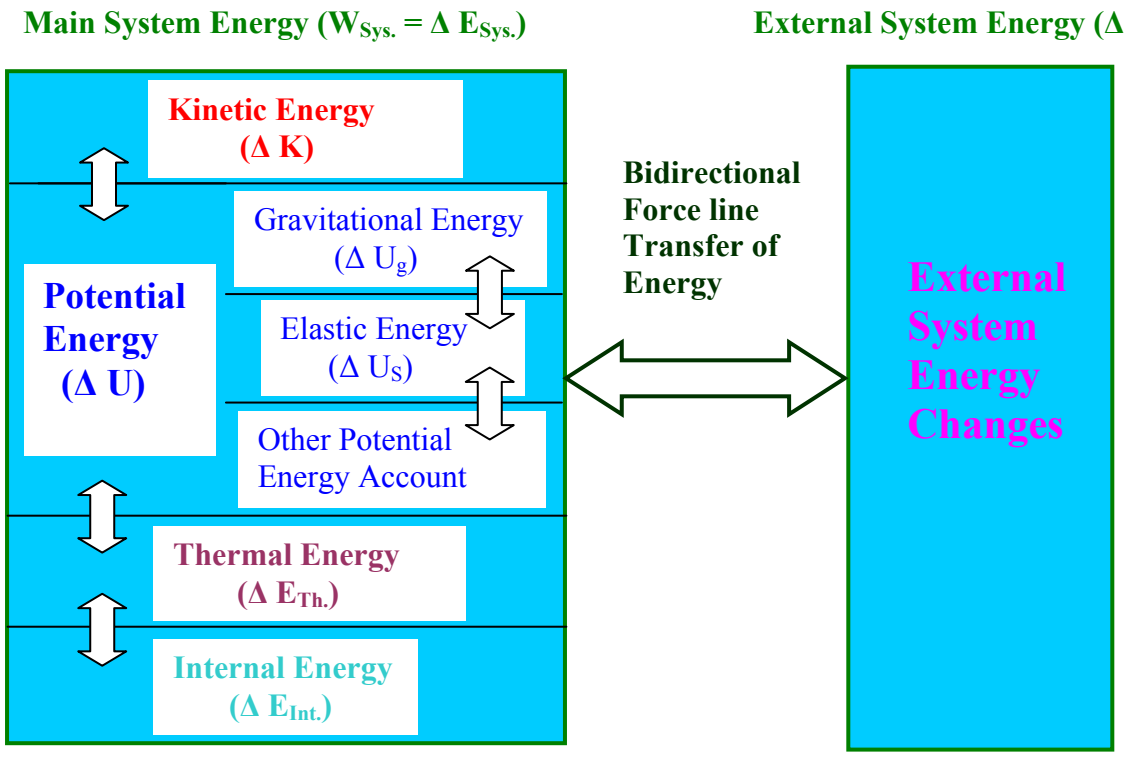
6- The relationship the Force and the Potential Energy (<u>three dimensional motion</u>) : $F(r) = \frac{d\,U(r)}{d\,r}$

7- The definition of the Thermal Energy: $\Delta E_{Th.} = f_k\,d$

8- The total Energy of a system: $E_{Sys.} = E_{Mec.} + U_s + E_{Th.} + E_{Int.}$

9- The relationship between change of the Energy of the System, the Work of the System, and change of the external Energy of another System is: $W_{Sys.} = \Delta E_{Sys.} = -\Delta E_{Ext.}$

10- For the Isolated System ($W_{Sys.} = \Delta E_{Sys.} = -\Delta E_{Ext.} = 0$), which means: $\Delta K + \Delta U_g + \Delta U_s + \Delta E_{Th.} + \Delta E_{Int.} = 0$



The formula $W_{Sys.} = \Delta E_{Sys.} = -\Delta E_{Ext.}$, has three cases:

a- $W_{Sys.}$ is grater than zero, which means the <u>energy transfer from the External system to the Main system</u> (The main system **<u>gains</u>** energy)

b- $W_{Sys.}$ is less than zero, which means the <u>energy transfer from the Main system to the External system</u> (The main system **<u>losses</u>** energy)

c- $W_{Sys.}$ is equal to zero, which mean the <u>energy is conserved</u> (The main system is **<u>Isolated</u>**)

11- The Power average is given by: $P_{avg.} = \frac{\Delta E}{\Delta t}$

12- Instantaneous Power is given by: $P = \frac{d\,E}{d\,t}$