Unit 05 – Vocabulary and Equations – Work, Energy & Power

Vocabulary:
previous vocabulary
Joule (J), Newton (N), Watt (W), Horsepower (hp)
Work (W)
Force (F)
Weight (Wt.)
kinetic energy (KE)
potential energy (PE)
gravitational potential energy (GPE, PE)
mechanical energy (ME)
elastic energy, spring constant
internal energy, heat
efficiency

Themed:
lever, inclined plane, pulley
isolated system

Symbols:
P, W, t, PE, KE, GPE, m, g, h, v, k

Equations & constants:
You get these on test:

$v = \frac{\Delta x}{\Delta t}$ $a = \frac{\Delta v}{\Delta t}$ 1 mi. = 1609 m =5280 ft
1 m/sec = 2.24 mph
0.4536 kg = 1 lb

$\Delta x = v_0 \Delta t + \frac{1}{2} a t^2$, $v_f^2 = v_i^2 + 2a \Delta x$

$v = v_0 + a \Delta t$ (v means v_f)

$v_x = v \cos\Theta$, $\Delta x = v_x t$, $v_i = v \sin \Theta$, $\Delta y = v_y t$

$F = ma$ $F_f = \mu F_n$ $p = mv$ $I = \Delta P = F\Delta t$

$W = Fd$ $P = W/t$ $PE = mgh = mg\Delta y$ $KE = \frac{1}{2} mv^2$

$W = \frac{1}{2} kx^2$ $F = kx$

1 hp = 746 W, 3,600,000 J = 1 kW-hr, 1 lb = 4.45 N

Themed: $AMA = F_{out}/F_{in}$ $IMA = d_{in}/d_{out}$

$P = F v$ $Wt. = mg$

Unit Objectives - Williams
1. I understand all the vocabulary & math of this unit and all demos, videos, equations, and class assignments.
2. I remember objectives & vocabulary from previous units.
3. I understand that positive work requires a parallel force components and increases the energy of the object
4. I can compute work where forces are at various angles relative to the displacement of the object
5. I know that work can be negative and what this implies
6. I can compute work, power and various energy forms in absolute and relative terms based on speed, mass, height and force direction values or changes in these values
7. I know conservation of energy including ME & friction converts useful energy (ME) to internal energy
8. I know common forms of energy and can identify them
9. I am able to compute power and can explain how it differs from work
10. I have memorized the current cost of energy locally per kilowatt hour
11. Given information on work, power, time etc., I can compute energy cost using the factor label method
12. I understand the relationship between work, force, energy and distance for brakes
13. I can recognize the relationships between W, P, t, d, K, etc graphically
14. I understand elastic systems including how force and stored energy vary with elongation/compression

DuPage ROE Objectives
401. I can identify if masses have kinetic and/or potential energy at a given instant.
402. I can identify potential energy as a function of position.
403. I can identify kinetic energy as a function of velocity.
404. I can calculate gravitational potential energy and kinetic energy.
405. I can identify an isolated system and analyze it.
406. I can identify that energy is transferred between different forms.
407. I can solve problems using conservation of mechanical energy.
408. I can apply the mathematical definition of work as the product of Force and displacement.
409. I can identify situations of positive work, negative work, zero work.
410. I can identify work as a change in energy.
412. I can analyze the rate of energy change of a system in terms of power.