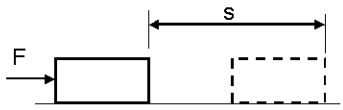
Chapter 14

Work, Energy and Power

U (work) = F x s



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Objectives

- Calculate Work:
  - –Based on a constant force
  - –Based on a variable force
- Apply Conservation of Energy
- Determine Power & Efficiency

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Energy

- 3 common types of energy:
  - –Work
  - –Potential energy
  - –Kinetic energy
- Conservation of energy works with these three types of energy

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Work of a Constant Force

- Work = force x distance

  U = (F) x (s)
- U = work, in joules (1 J = 1 N-m)
- F = force, in newtons (N)
- s = distance, in meters (m)

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Work, English Units

- Work = force x distance

  U = (F) x (s)
- U = work, in ft-lb
- F = force, in lb
- s = distance, in ft

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Work of a Variable Force

- Springs vary force in a linear fashion
- Spring constant is the average force per inch of deflection

  F = kx

  Where k = spring constant, in-lb/in

  x = deflection from free length

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Calculating work in springs

- Since Force goes from 0 to F during spring compression, work can be calculated using the average force
- Spring Work = ((1/2)kx) x = $(1/2)kx^2$
- Can be analyzed by determining the area under the curve of a force-deflection graph

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Translational Energy - PE

- Potential Energy
  - –Typically raising a weight to a new height
  - –PE = W x h
    - Where W = weight of object
    - Where h = vertical height

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Translational Energy – KE

- Kinetic Energy
  - –Energy of a moving object
- Derived from U = Fs and

$$v^2 = v_0^2 + 2as$$

- KE = $(1/2)m(v^2-v_0^2)$ or,
- KE = (1/2)mvExample 13-1

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Week 11 Homework

- Chapter 14
  - – Problems: 6, 9, 20, 23
- Read Sections 14-5 thru 14-7 for next week

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