Lecture 2. Energy, Work, and Heat: The First Law of Thermodynamics

Read sections 12.3 - 12.6 in your Intro to ME textbook.

Thermodynamics is the study of the conversion of energy from one form to another. Let us examine some of the more common forms of energy.

Consider a pendulum suspended from the ceiling by a string. Hold the pendulum in a horizontal position, position 1 in the figure below, and released it from rest. The pendulum will swing to position 2, then 3, back to 2 and 1. It will keep swinging back and forth if there is no friction anywhere in the system.



Initially, the pendulum is at a height of z_1 above a reference level relative to the lowest position. The **potential energy**, *PE*, of the pendulum is *mgz*, where *m* is the mass and *g* is the gravitational constant, respectively. Thus, the potential energy initially is:

$$PE_1 = mgz_1$$

Define the kinetic energy, KE, of the pendulum as

$$KE = \frac{1}{2}mv^2$$

Since we are releasing it from rest, its velocity will be zero, and its kinetic energy will be also zero.